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Smith

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(54) **ROOF OR WINDOW PANEL TO METAL ROOFING OR SIDING INTERFACE SECUREMENT SYSTEM**

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(51) **Int. Cl.**

E04B 1/68	(2006.01)
E04D 13/03	(2006.01)
E04D 13/00	(2006.01)
E04D 13/15	(2006.01)
E04D 13/147	(2006.01)

(52) **U.S. Cl.**

CPC ***E04D 13/00*** (2013.01); ***E04D 13/03*** (2013.01); *E04D 13/147* (2013.01); *E04D 13/15* (2013.01)

(58) **Field of Classification Search**

CPC E04B 7/18; E04B 1/68; E04B 1/684; E04D 13/03; E04D 13/00; E04D 13/15; E04D 13/14; E04D 13/147; E04D 1/36; E04D 1/365; E04D 3/36

USPC 52/173.3, 218, 219, 200, 198, 57, 60

See application file for complete search history.

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Primary Examiner — Phi A

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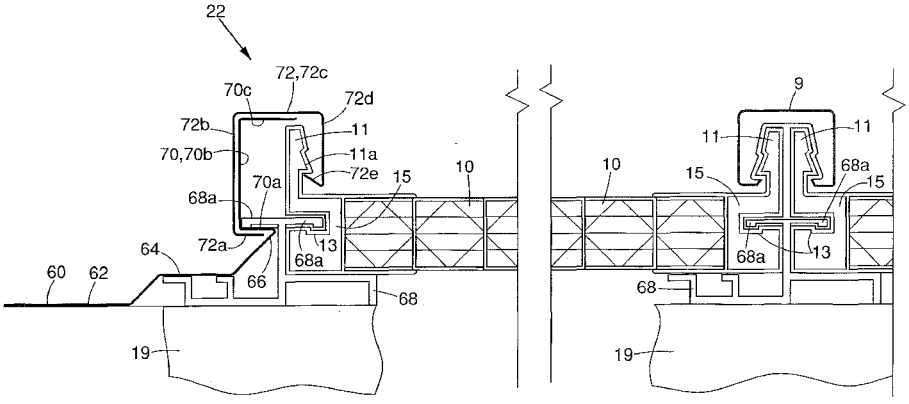
(57) **ABSTRACT**

A securement system for a roof or window panel includes a first side structure which can secure and seal a first side of the roof or window panel and can include a first side structure panel having an outer side flange for integrating or interfacing with roofing or siding which can include insertion thereunder. A raised cricket can extend laterally inwardly from the outer side flange for directing water away from the first side of the roof or window panel. An engagement ridge can extend along or from an inner edge of the cricket for engaging a retention structure extending along the first side of the roof or window panel. An open polygonal channel cap can have an outer edge for engaging at least one of the engagement ridge of the first side panel cricket and the retention structure, and an inner edge for engaging the roof or window panel. The cap can be capable of being resiliently snapped in place and provide water proofing and rigidity to the first side structure.

12 Claims, 18 Drawing Sheets



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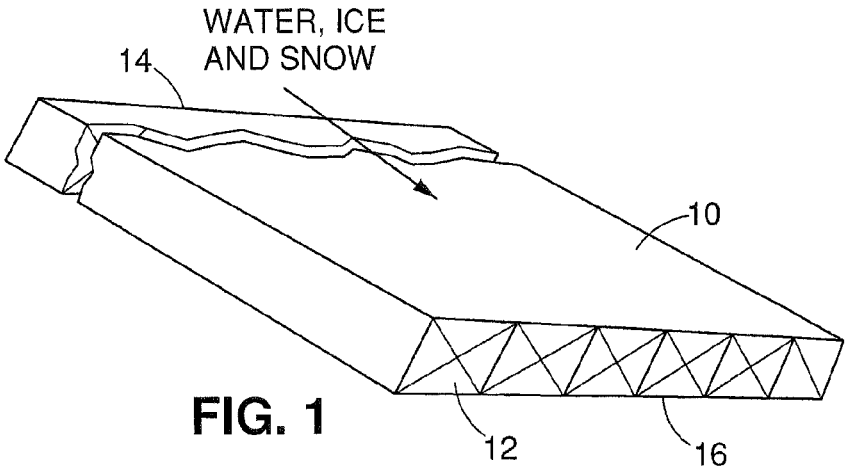

WATER, ICE
AND SNOW
14
10
12
16

FIG. 1

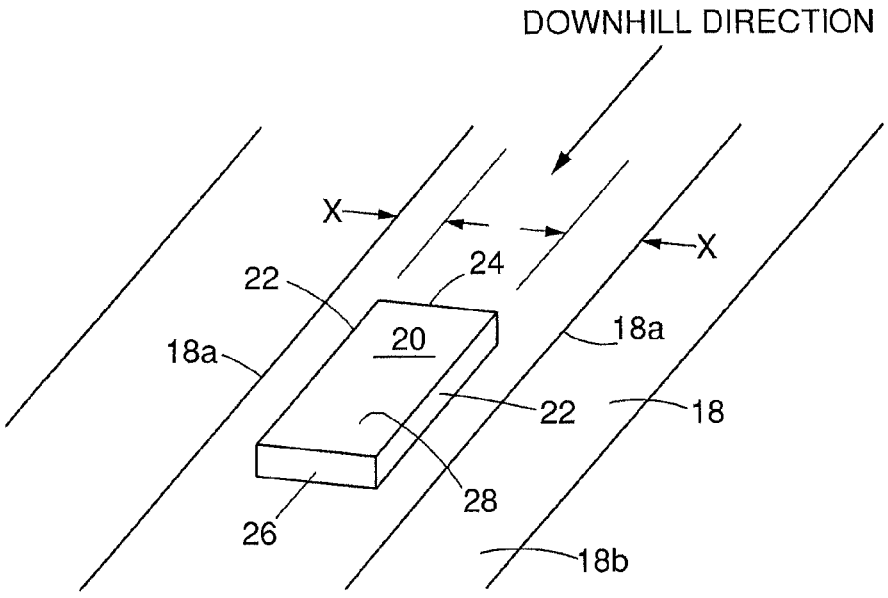

DOWNHILL DIRECTION
X
X
22
24
20
18a
18a
22
18
28
26
18b

FIG. 2

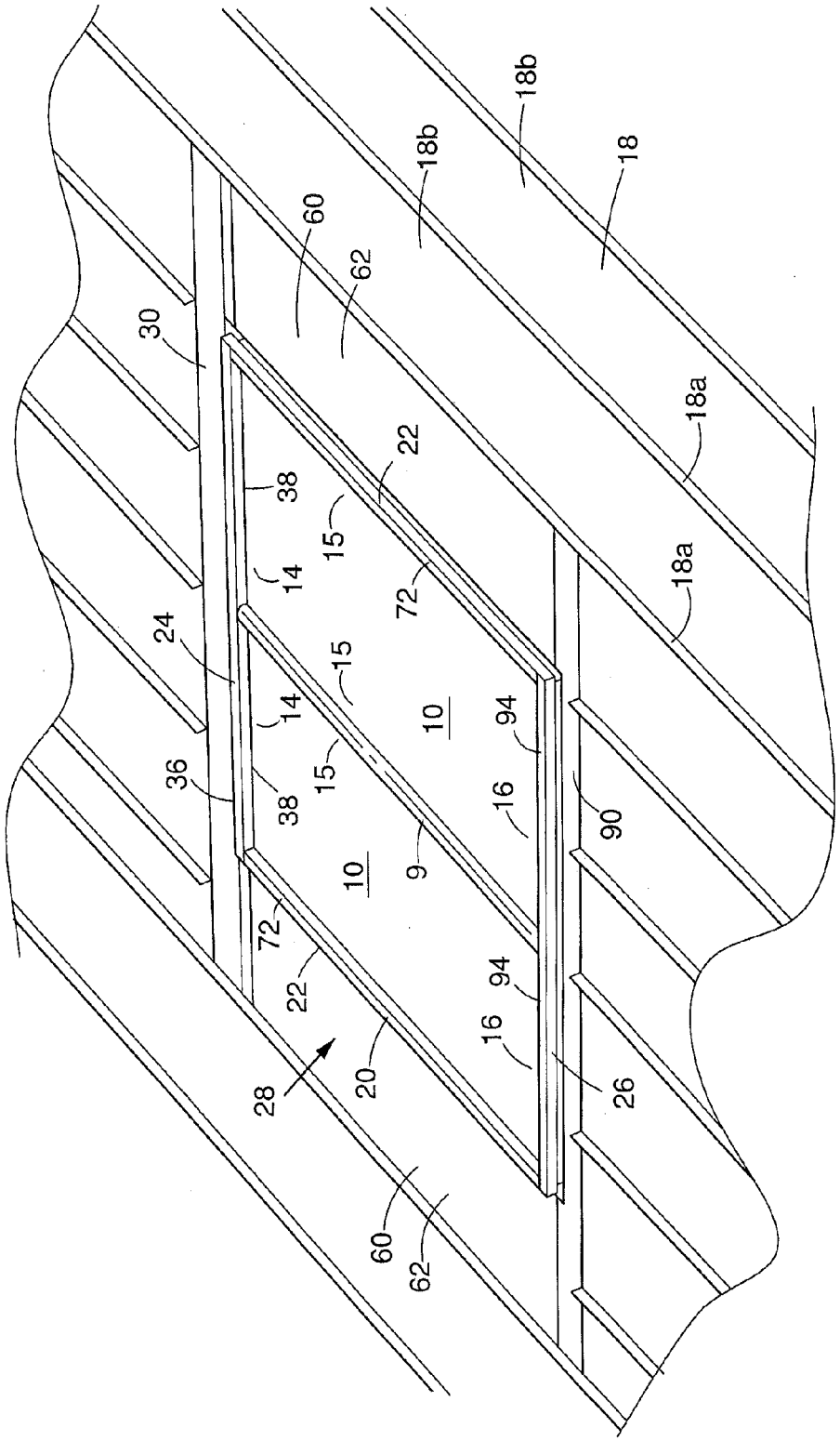

18b
18b
18
60
62
30
18a
22
38
15
14
72
24
18a
15
14
10
94
36
15
38
16
90
9
10
72
22
94
16
20
28
26
60
62

FIG. 3

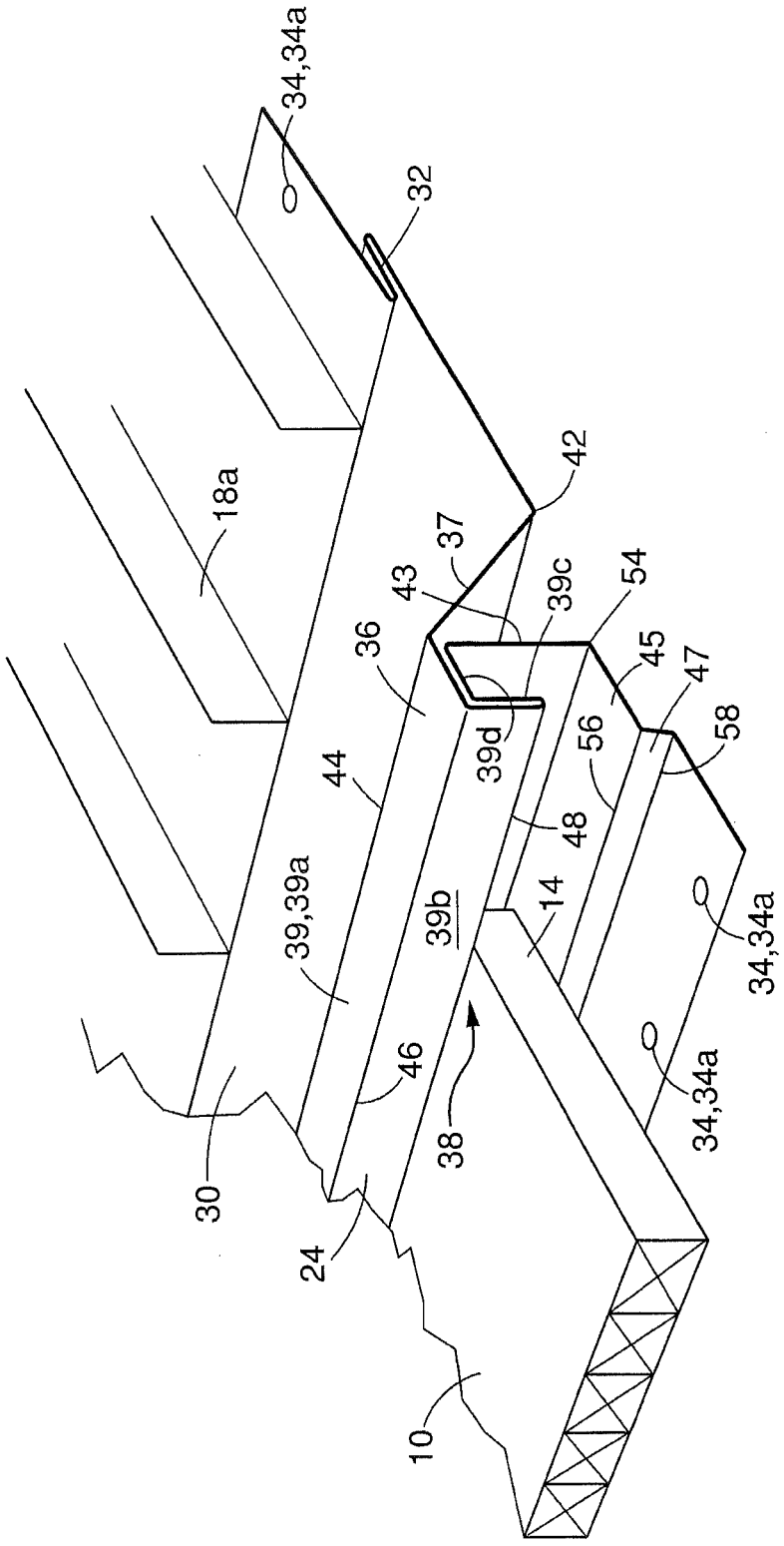

34,34a
32
42
18a
37
43
39c
54
36
45
47
39d
56
58
44
48
39,39a
39b
14
34,34a
46
34,34a
38
30
24
10

FIG. 4

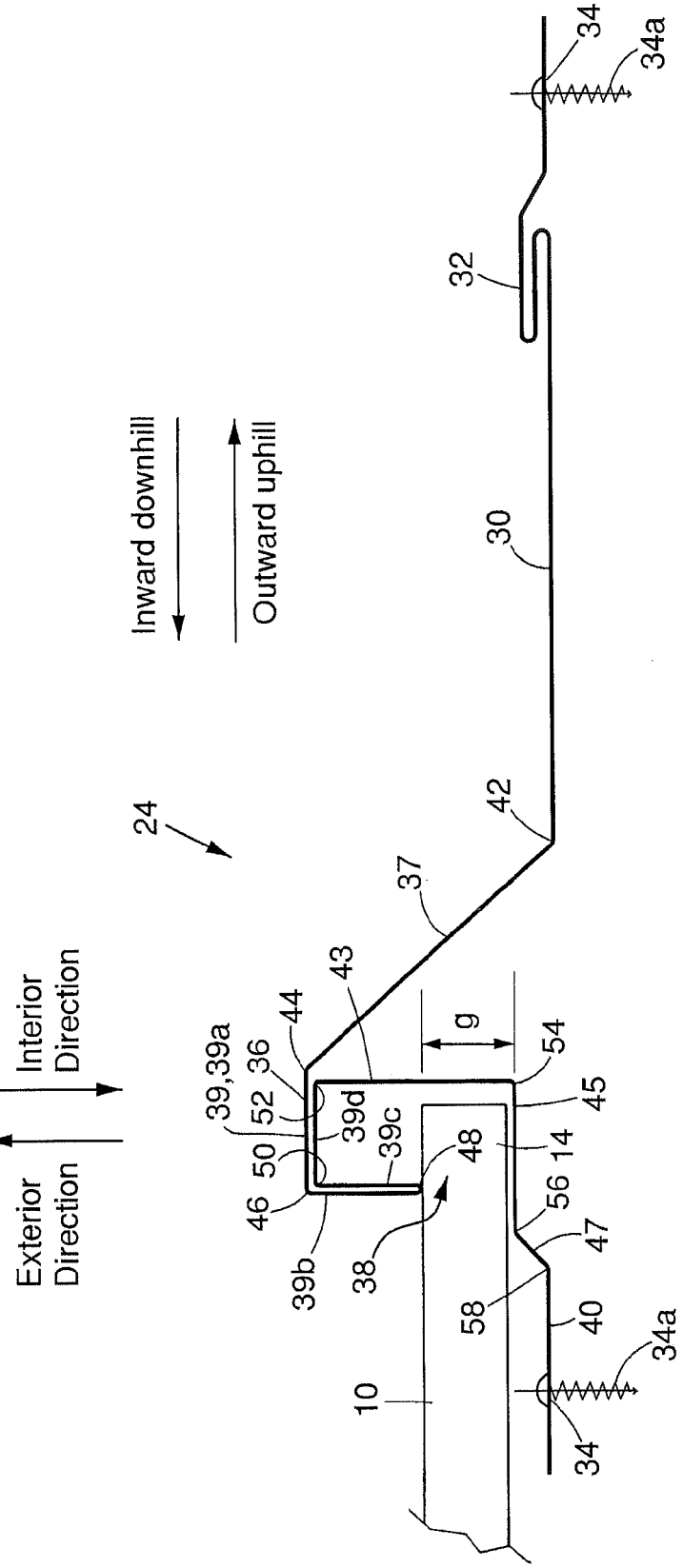

Interior Direction
Exterior Direction
Inward downhill
Outward uphill
24
10
30
32
34
34a
34
34a
37
38
39,39a
39b
39c
39d
40
42
43
44
45
46
47
48
50
52
54
56
58
36
14
g

FIG. 5

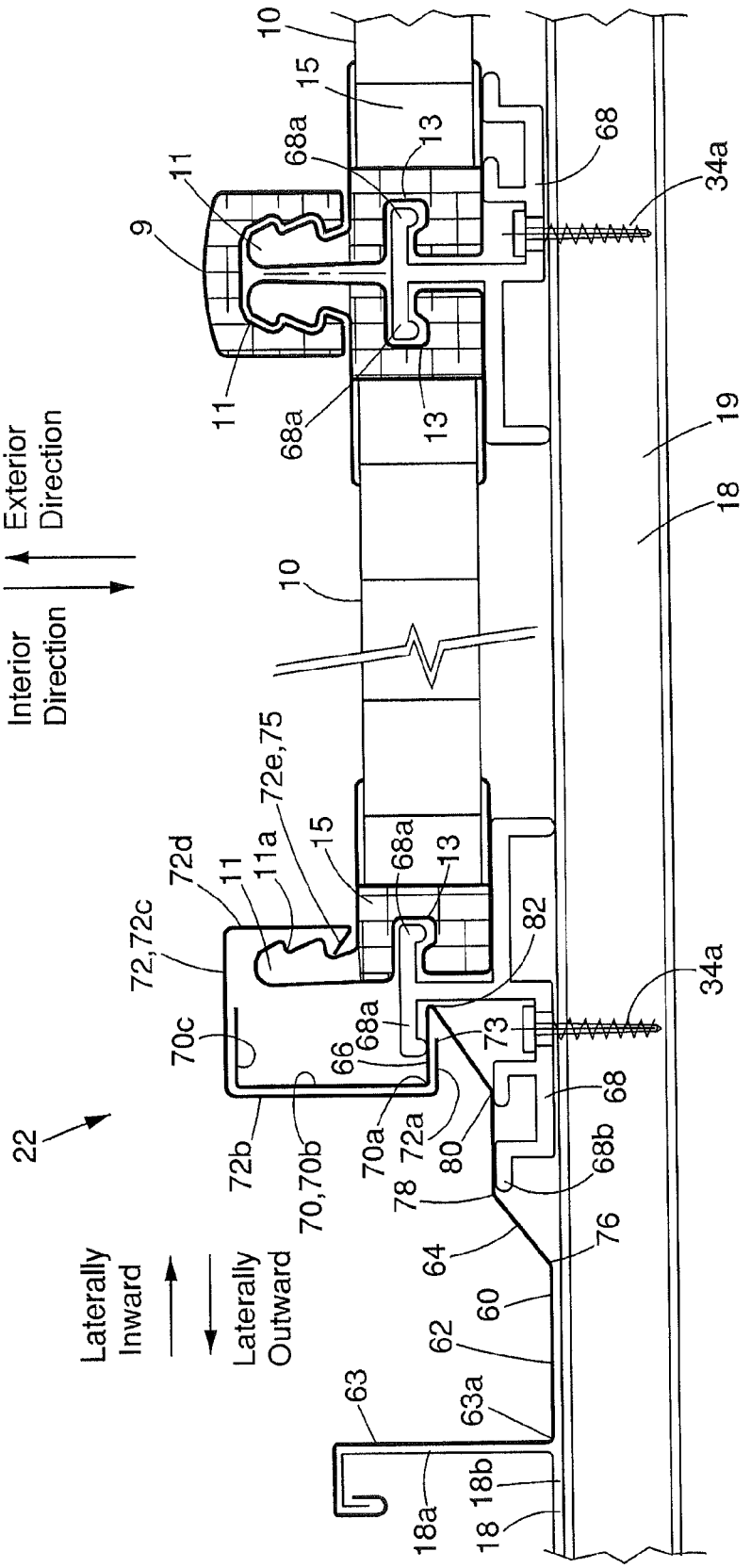

Exterior Direction
Interior Direction
Laterally Inward
Laterally Outward
22
10
15
68a
13
68
34a
9
11
19
18
72e,75
72d
11a
72,72c
70c
66
73
82
72b
70,70b
70a
72a
80
78
64
76
60
62
63
63a
18b
18a
18

FIG. 6

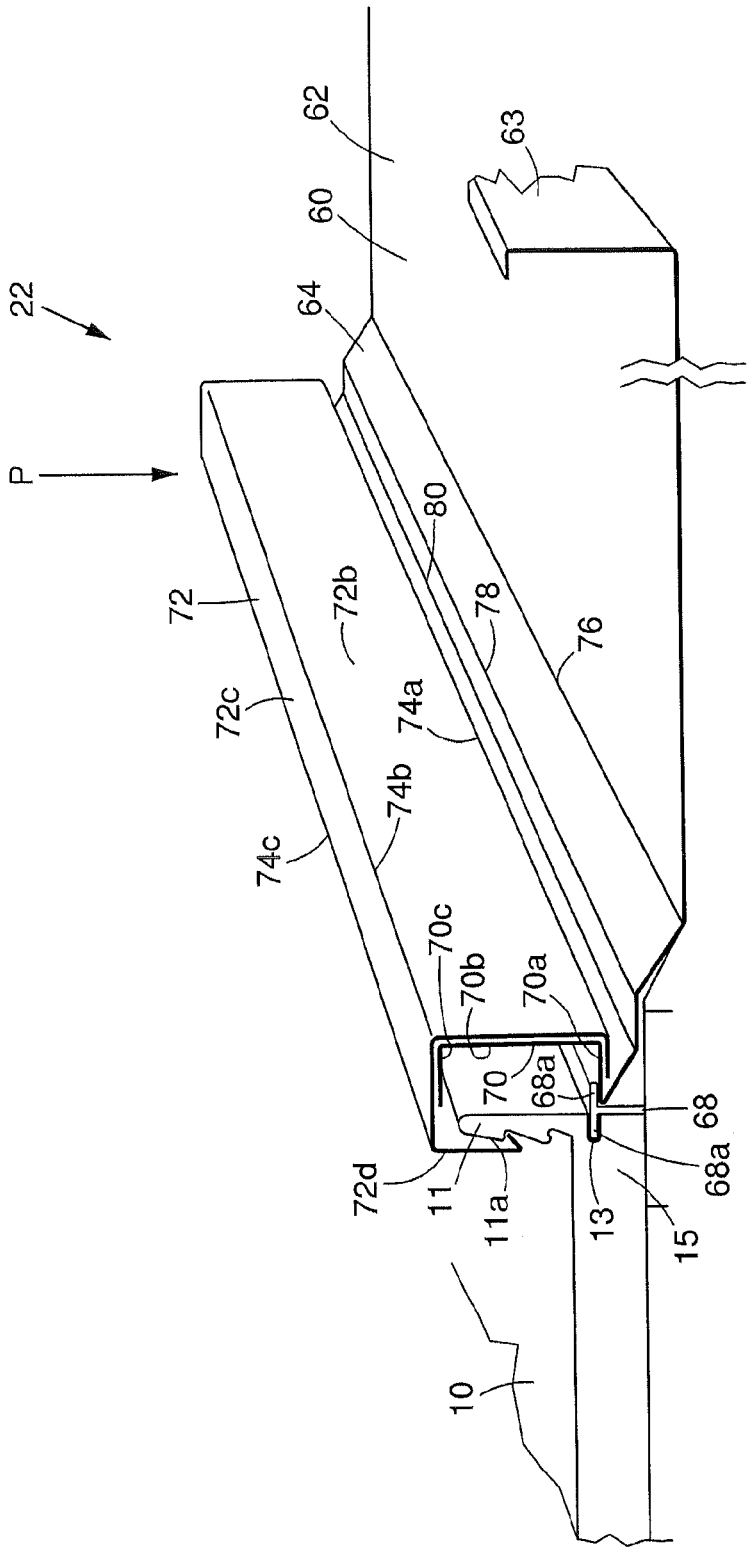

22
P
62
63
60
64
80
78
76
72
72b
72c
74a
74b
74c
70c
70b
70a
70
68a
68
72d
11
11a
13
15
10

FIG. 7

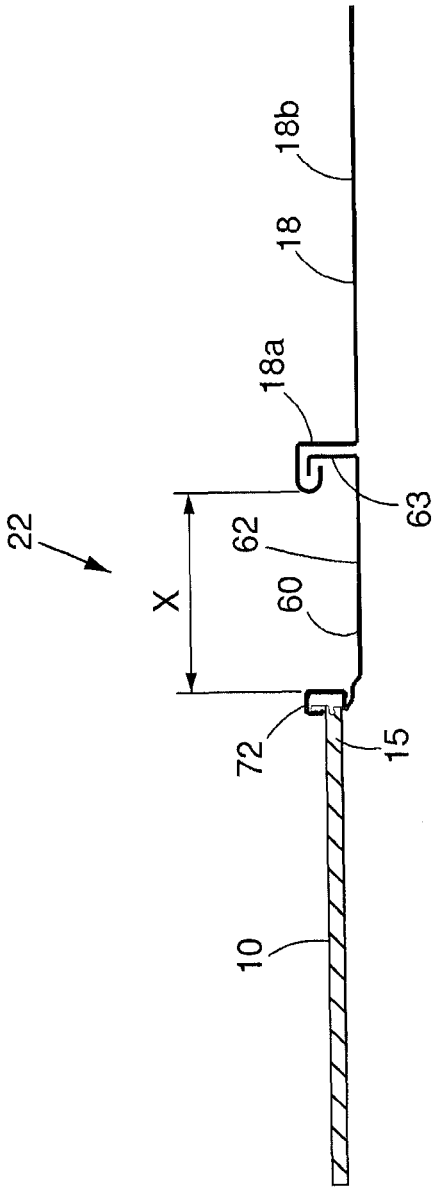


FIG. 8

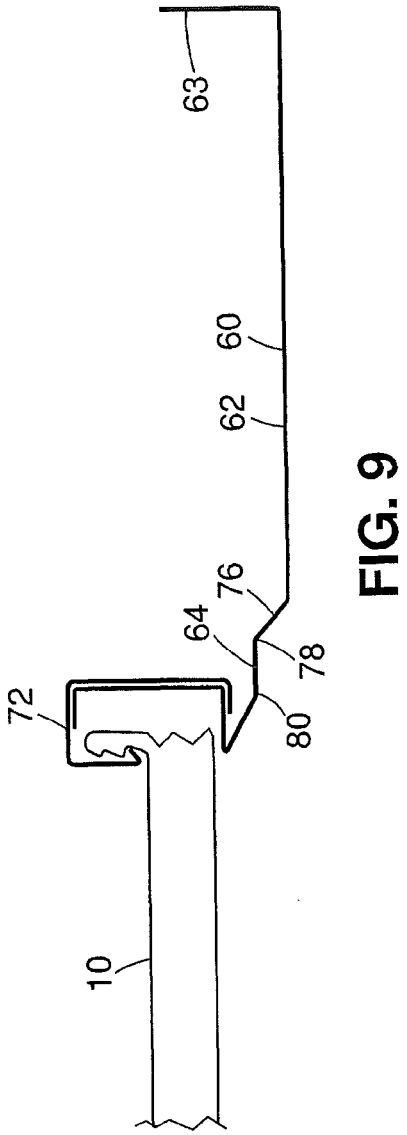


FIG. 9

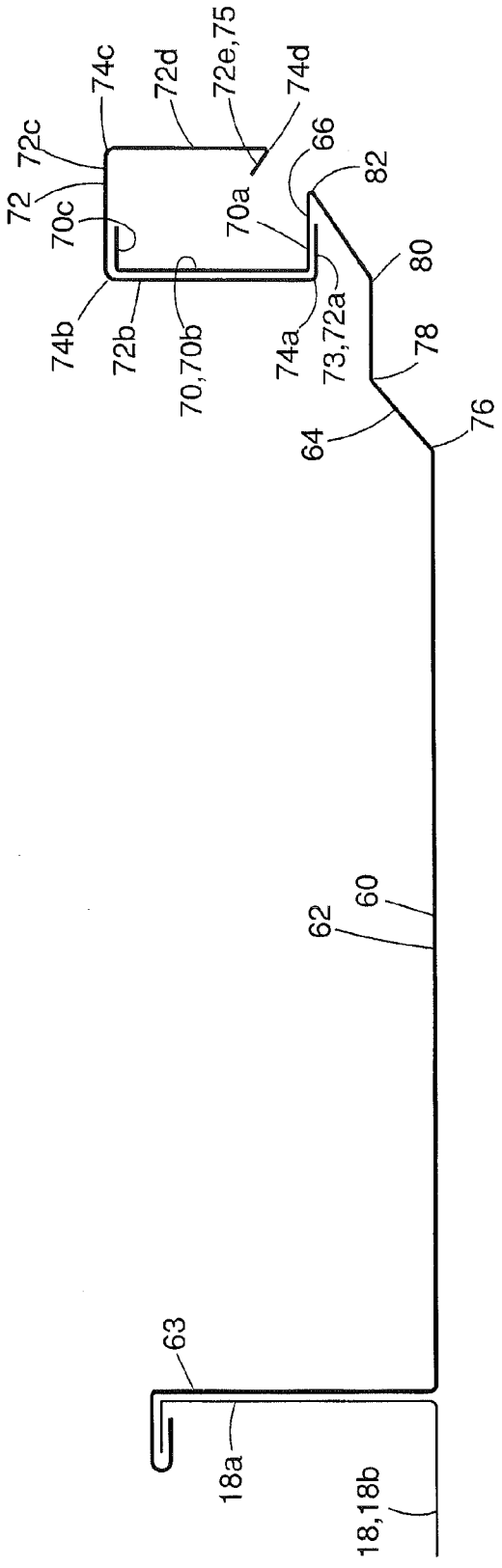

74c
72d
72e,75
74d
72c
66
82
72
70c
70a
80
74b
72b
70,70b
74a
73,72a
78
64
76
62
60
63
18a
18,18b

FIG. 10

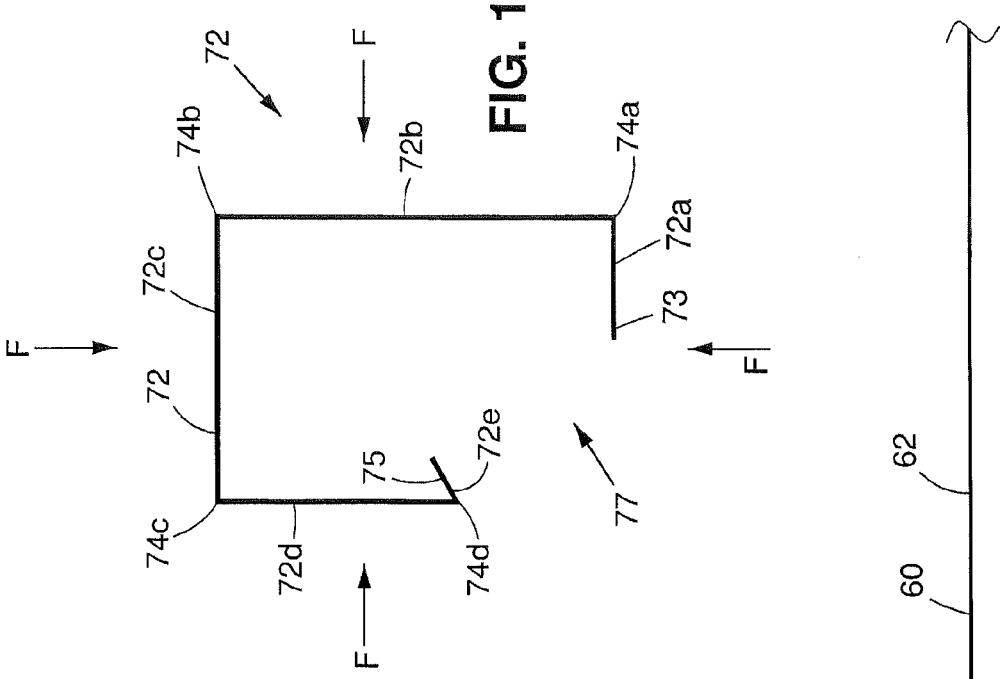

72
F
74b
72b
74a
72a
73
72c
72
74c
72d
75
72e
74d
77
F
F

FIG. 12

Laterally Inward
Laterally Outward
Exterior Direction
Interior Direction
74b
72b
72c
72
74c
72d
86
70c
75
70,70b
72e
74d
84
74a
72a
70a
66
73
82
80
78
64
76
60
62

FIG. 11

FIG. 13

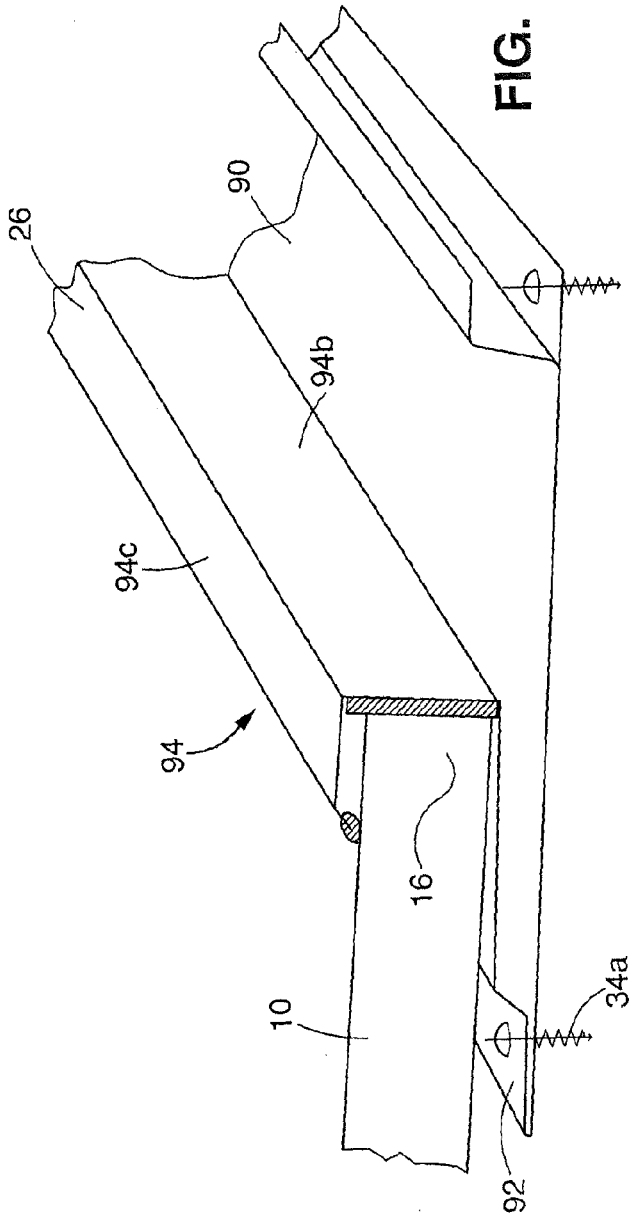
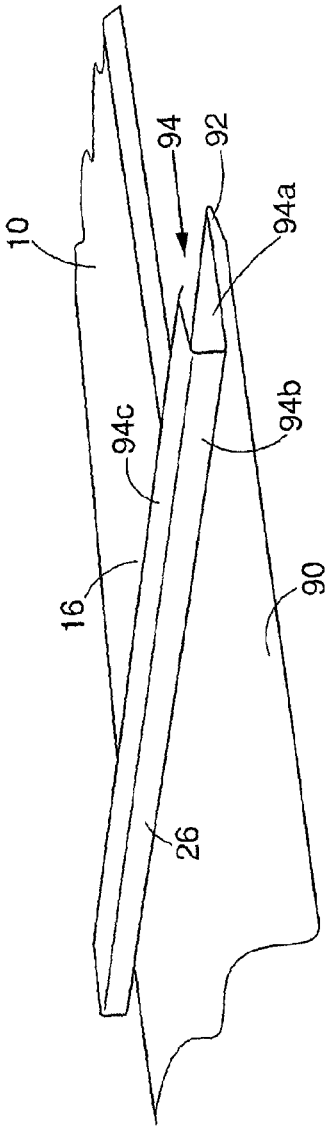


FIG. 14



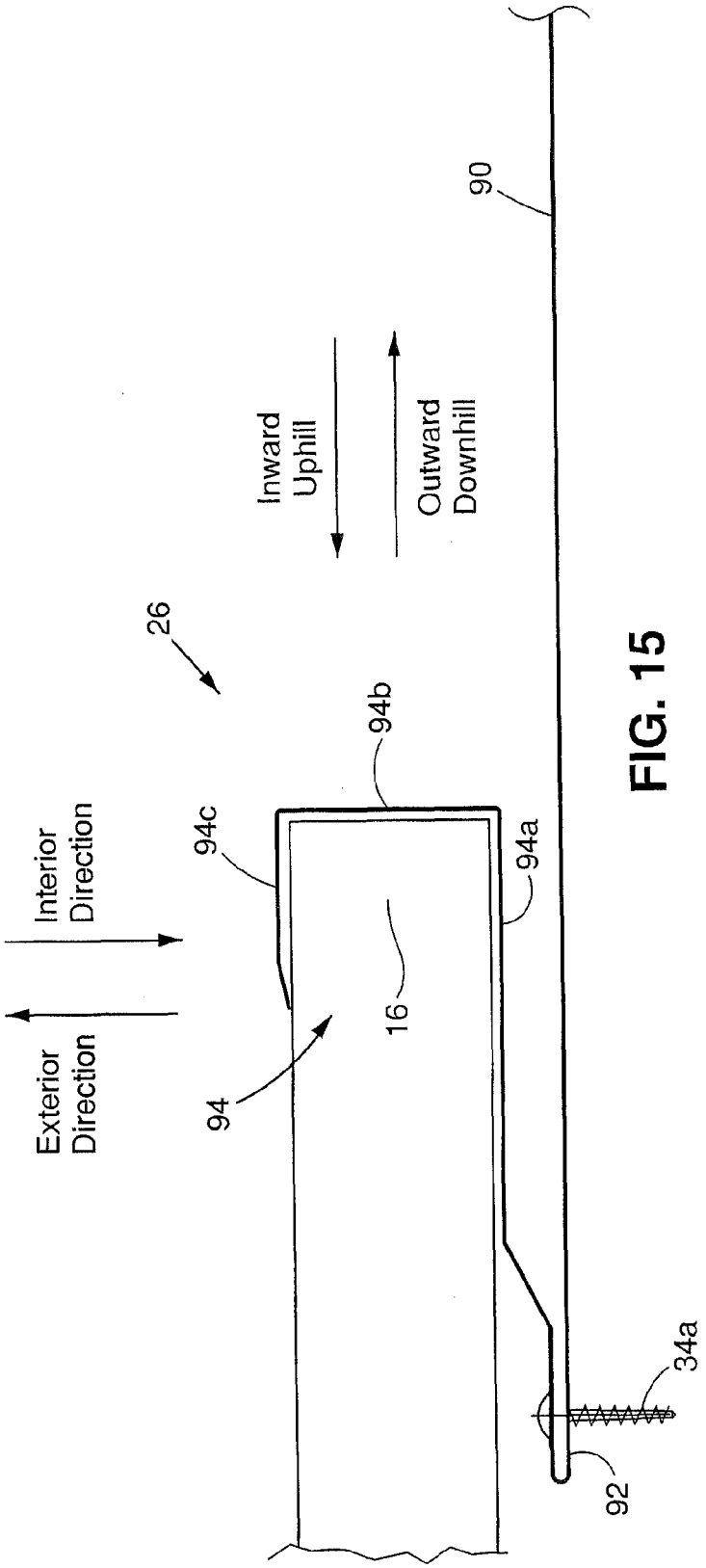

90
Inward
Uphill
Outward
Downhill
26
94b
94c
94a
Interior
Direction
16
Exterior
Direction
94
34a
92

FIG. 15

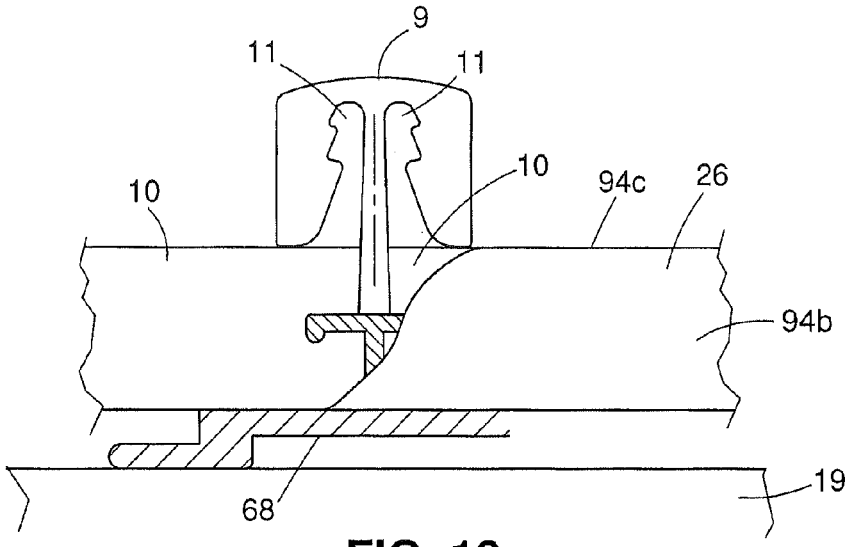


FIG. 16

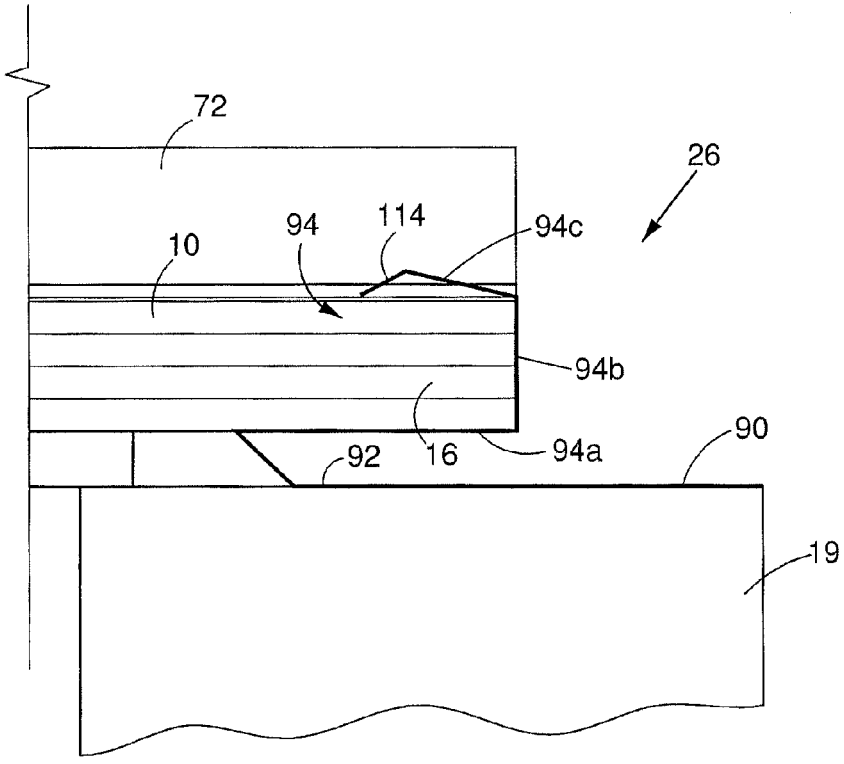


FIG. 21

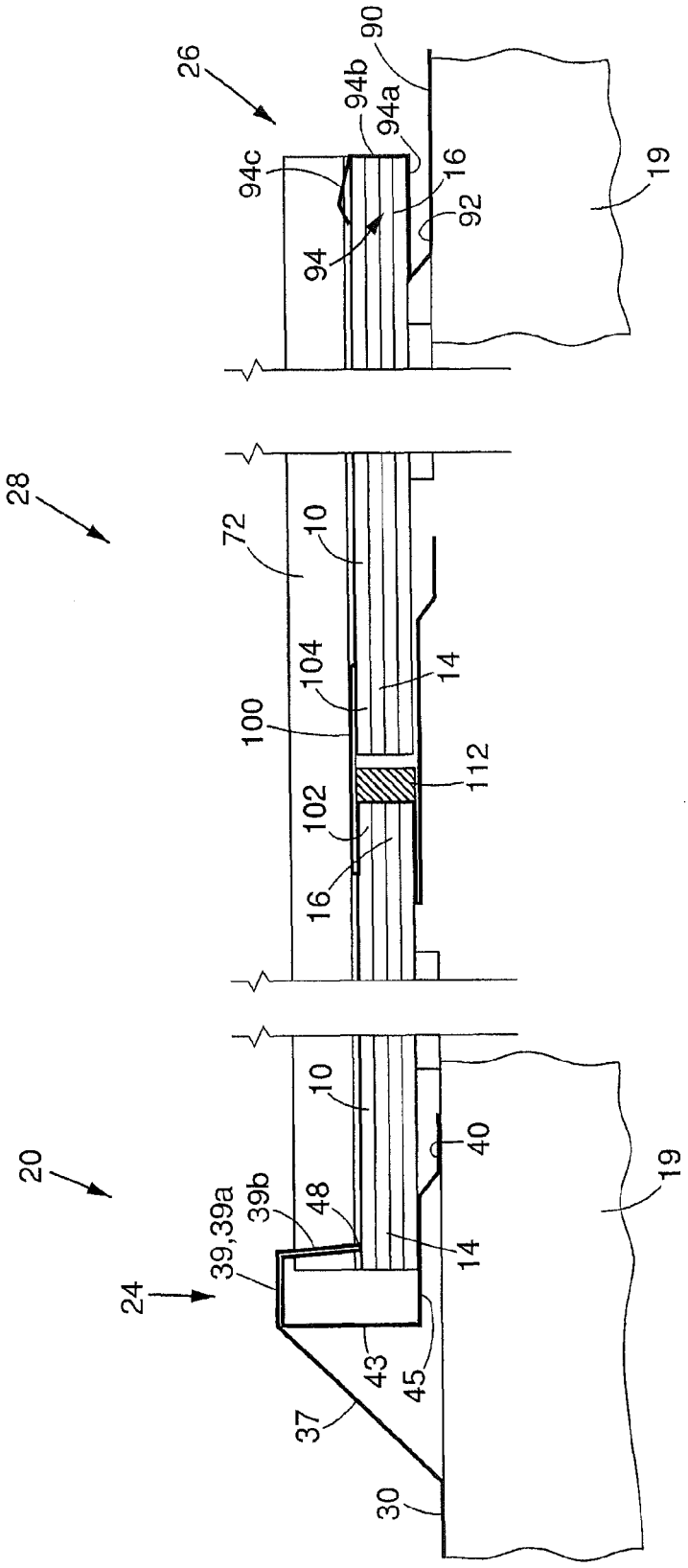

26
90
94b
94a
94c
16
19
92
94
28
72
10
104
14
100
112
102
16
10
20
40
19
39b
48
39,39a
14
24
43
45
37
30

FIG. 17

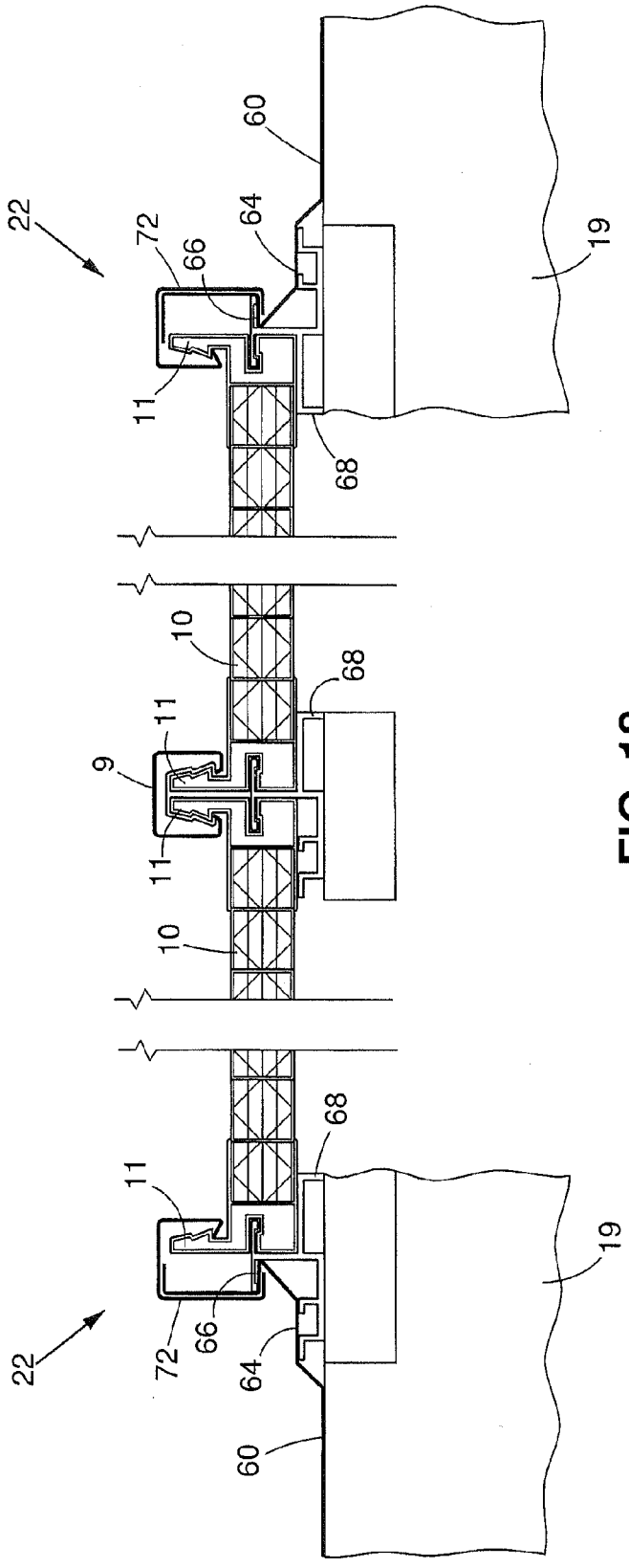


FIG. 18

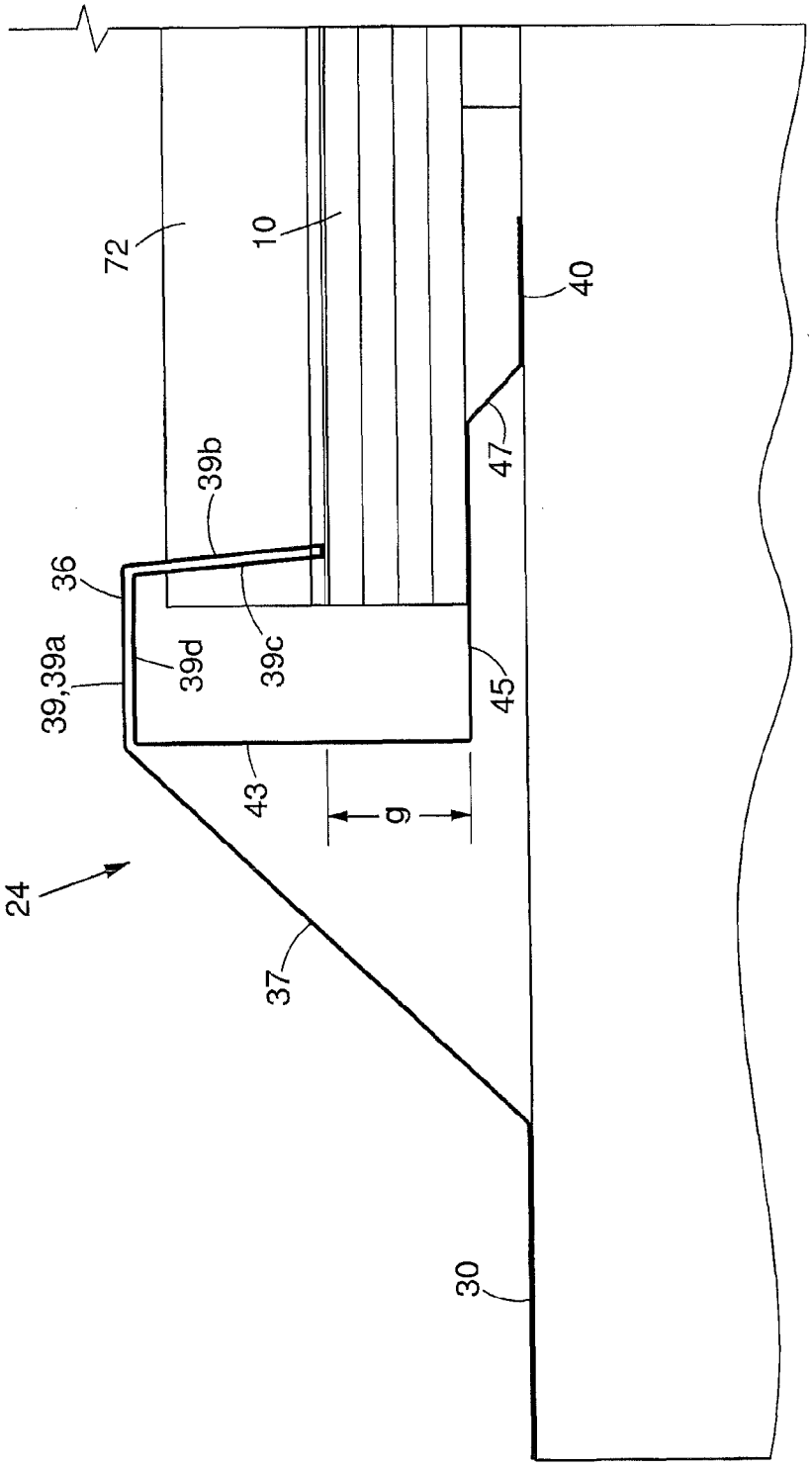


FIG. 19

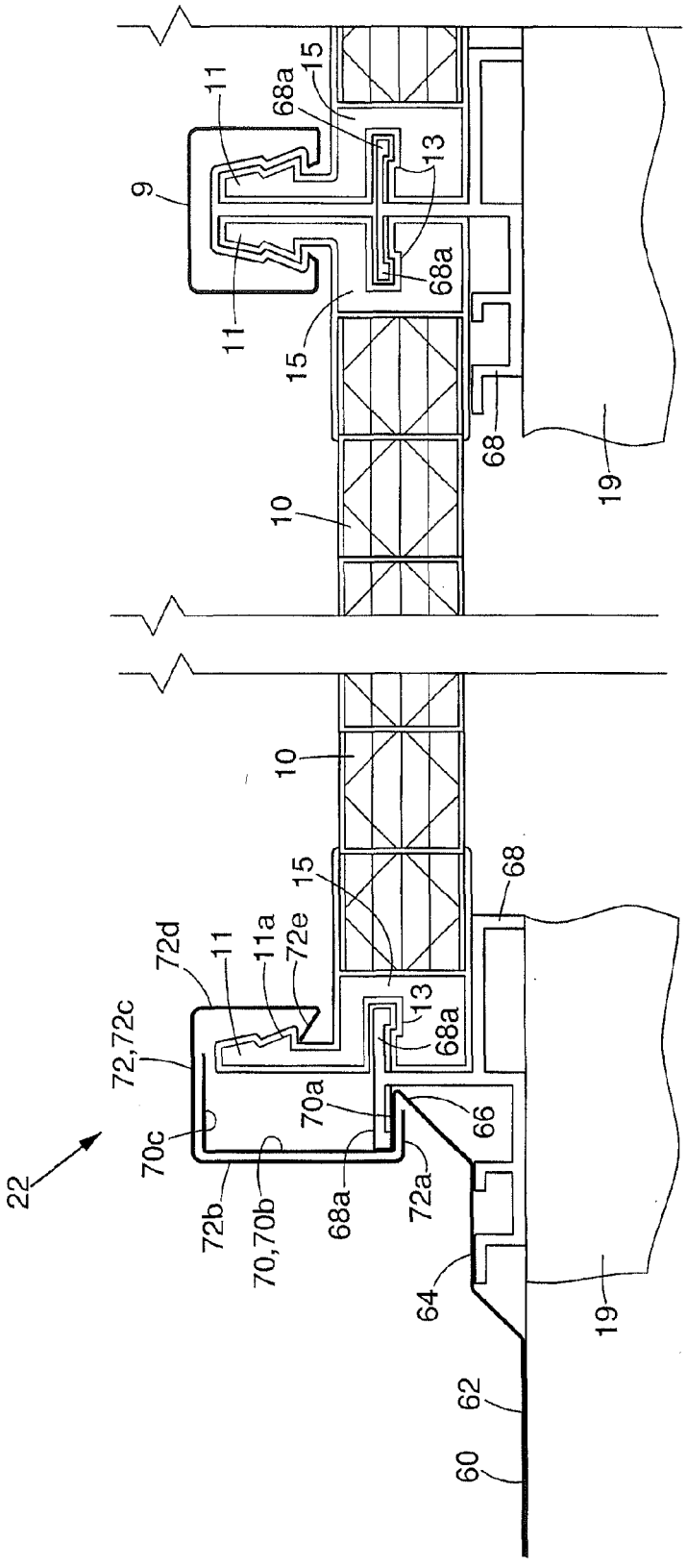

9
11
68a
15
13
68a
11
15
68
19
10
10
15
68
72d
11
11a
72e
13
68a
72,72c
70a
66
70c
22
72b
70,70b
68a
72a
64
19
62
60

FIG. 20

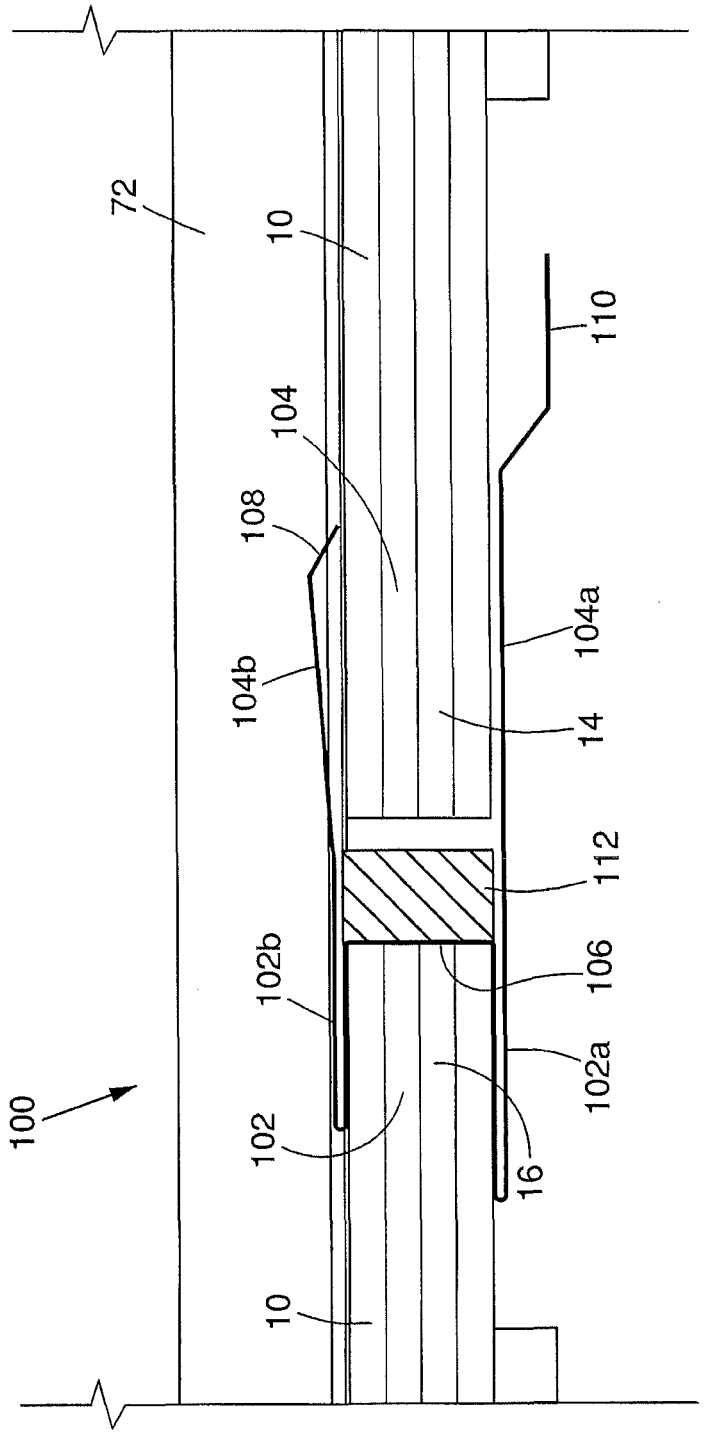


FIG. 22

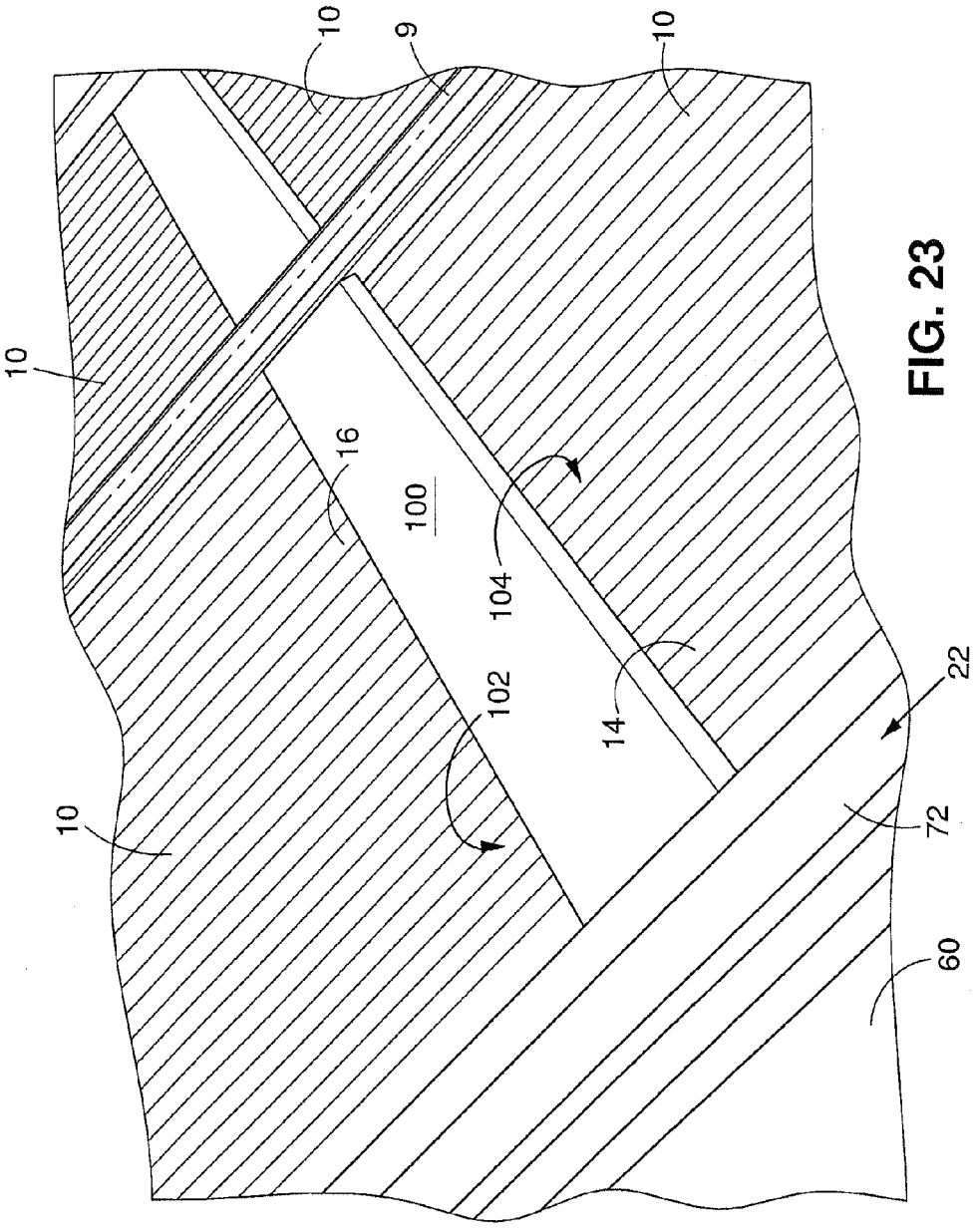


FIG. 23

ROOF OR WINDOW PANEL TO METAL ROOFING OR SIDING INTERFACE SECUREMENT SYSTEM

RELATED APPLICATION(S)

This application claims the benefit of U.S. Application No. 61/723,131, filed Nov. 6, 2012.

The entire teachings of the above application are incorporated herein by reference.

BACKGROUND

Roof or window panels require interfaces to secure and seal the panels to the roof or side of a structure, and leaking or insufficient securement can sometimes occur in some existing installations.

SUMMARY

The present invention can provide a roof or window panel to roofing or siding interface securement system, which can provide sufficient securement and sealing for roof or window panels in a simple and easy manner.

The present invention can provide a securement system for a roof or window panel including a first side structure which can secure and seal a first side of the roof or window panel and can include a first side structure panel having an outer side flange for integrating or interfacing with roofing or siding which can include insertion thereunder. A raised cricket can extend laterally inwardly from the outer side flange for directing water away from the first side of the roof or window panel. An engagement ridge can extend along or from an inner edge of the cricket for engaging a retention structure extending along the first side of the roof or window panel. An open polygonal channel cap can have an outer edge for engaging at least one of the engagement ridge of the first side panel cricket and the retention structure, and an inner edge for engaging the roof or window panel. The cap can be capable of being resiliently snapped in place and provide water proofing and rigidity to the first side structure.

In particular embodiments, a header panel can be included having an outer header flange for integrating or interfacing with or insertion under roofing or siding. A raised cricket can extend downhill or inwardly from the outer header flange for directing water away from an upper end of the roof or window panel. The cricket can have a slot for accepting and trapping an upper edge of the roof or window panel. An inner flange can extend downhill or inwardly from the cricket below the slot for securement to the roof or side of a building or structure. A second side structure can secure and seal a second side of the roof or window panel. A sill panel can be included having an outer sill flange for integrating or interfacing with or positioning over roofing or siding. An inner sill flange can extend uphill or inwardly from the outer sill flange for securement to the roof or side of the structure. An uphill facing retention slot can extend downhill or outwardly from the inner sill flange over at least a portion of the inner sill flange for receiving and trapping a lower edge of the roof or window panel. The header panel, side panels, caps and sill panel can be formed from sheet metal. The retention structure can include at least one anchor bracket, member or clip secured to the first side of the roof or window panel. The at least one anchor member can engage a structure along the first side of the roof or window panel.

The header panel slot can include an exterior slot member and an interior slot member. The exterior slot member can include a first portion extending in the downhill direction from the raised cricket in a spaced relationship to the interior slot member, and a second portion can extend from the first portion towards the interior slot member for trapping the window panel between the second portion of the exterior slot member and the interior slot number. The header panel slot can be formed of sheet metal extending inwardly in the downhill direction from the raised cricket and bent to provide the first and second portions of the exterior slot member with two layers of sheet metal, and the interior slot member with one layer of sheet metal. The sheet metal forming the first portion of the exterior slot member can extend inwardly in the downhill direction from the raised cricket generally parallel to the interior slot member, and can be bent from the first portion and extend towards the interior slot member to form the second portion of the exterior slot member, and can be bent against and extend along the second portion and the first portion of the exterior slot member to form the second and first portions with a double sheet metal layer, and can be bent from the first portion of the exterior slot member towards the interior slot member to form an uphill member of the header panel slot, and can be bent inwardly in the downhill direction from the uphill member to form the interior slot member. At least a portion of at least one slot member can be capable of resilient deflection for gripping the window panel. The first portion of the exterior slot member can extend in the downhill direction from the raised cricket at least about 1 inch and the second portion can extend from the first portion about 1.2 inches.

The open polygonal channel cap can be elongate and can have a cross section with a laterally inwardly extending side panel engagement leg forming the outer edge for engaging the engagement ridge of the first side panel. An outer side wall can extend in an exterior direction from the side panel engagement leg. An exterior connecting wall can extend laterally inwardly from the outer side wall. An inner side wall can extend in the interior direction from the exterior connecting wall and terminate in an outwardly angled window panel engagement leg, forming the inner edge that extends in an angled direction toward the outer side wall and the exterior connecting wall. In the cross section of the open polygonal channel cap, the side panel engagement leg can be shorter than the exterior connecting wall. The inner side wall can be shorter than the outer side wall, and the window panel engagement leg can be shorter than the exterior connecting wall. The open polygonal channel cap can be formed of sheet metal, with respective corners between the side panel engagement leg and the outer side wall, between the outer side wall and the exterior connecting wall, between the exterior connecting wall and the inner side wall, and between the inner side wall and the window panel engagement leg. In the cross section of the open polygonal channel cap, the side panel engagement leg can be about 0.33 inches, the outer side wall can be about 1.3 inches, the exterior connecting wall can be about 0.95 inches, the inner side wall can be about 0.8 inches, and the window panel engagement leg can be about 0.25 inches. The open polygonal channel cap can have a cross section having a perimeter with 5 sides with an opening between the outer edge and the inner edge.

The engagement ridge of the side panel can extend laterally outwardly from the raised side panel cricket and can be generally channel shaped for engaging the open polygonal channel cap. The side panel can be formed of sheet metal and the engagement ridge can have a retention structure engagement leg bent laterally outwardly from the side panel raised cricket. An outer side wall can be bent from the retention structure engagement leg in the exterior direction, and an exterior wall

can be bent laterally inwardly from the outer side wall. In a cross section of the engagement ridge, the retention structure engagement leg can be about 0.43 inches, the outer side wall can be about 1.25 inches, and the exterior wall can be about 0.65 inches. The open polygonal channel cap can engage the retention structure engagement leg, the outer side wall and the exterior wall.

The retention slot of the sill panel can include an interior slot member extending outwardly in the downhill direction from the inner sill flange. A slot end wall can extend in the exterior direction from the interior slot member, and an exterior slot member can extend inwardly in the uphill direction. The exterior slot member of the retention slot of the sill panel can have a bent portion for resiliently gripping the window panel. The sill panel can be formed of sheet metal.

A panel joining component can be included for joining two window panels together, having an uphill panel slot and a downhill panel slot. The panel joining component can be formed of a single piece of sheet metal bent into a generally H shaped cross section for forming the uphill and downhill panel slots. The uphill panel slot can have opposing walls with two layers of sheet metal, and the downhill panel slot can have opposing walls with a single layer of sheet metal. The downhill slot can have an exterior wall having a bent edge for resiliently gripping a respective window panel.

The present invention can also provide an open polygonal elongate channel cap formed of sheet metal for securing a window panel to a side panel. The channel cap can have a cross section including a laterally inwardly extending side panel engagement leg forming an outer edge for engaging an engagement ridge of the side panel. An outer side wall can extend in an exterior direction from the side panel engagement leg. An exterior connecting wall can extend laterally inwardly from the outer side wall. An inner side wall can extend in the interior direction from the exterior connecting wall and terminate in an outwardly angled window panel engagement leg forming an inner edge and extending in an angled direction towards the outer side wall and the exterior connecting wall, for engaging the window panel. Respective bent corners can be between the side panel engagement leg and the outer side wall, between the outer side wall and the exterior connecting wall, between the exterior connecting wall and the inner side wall, and between the inner side wall and the window panel engagement leg.

In particular embodiments, there can be an opening between the outer edge and the inner edge. In the cross section, the side panel engagement leg can be shorter than the exterior connecting wall, the inner side wall can be shorter than the outer side wall, and the window panel engagement leg can be shorter than the exterior connecting wall. In the cross section of the channel cap, the side panel engagement leg can be about 0.33 inches, the outer side wall can be about 1.3 inches, the exterior connecting wall can be about 0.95 inches, the inner side wall can be about 0.8 inches, and the window panel engagement leg can be about 0.25 inches.

The present invention can also provide a method of securing a roof or window panel with a securement system including securing and sealing a first side of the roof or window panel with a first side structure having a first side panel with an outer side flange for interfacing with roofing or siding. A raised cricket can extend inwardly from the outer side flange for directing water away from the first side of the roof or window panel. An engagement ridge can extend from an inner edge of the cricket for engaging a retention structure extending along the first side of the roof or window panel. An open polygonal channel cap having an outer edge and an inner edge, can engage at least one of the engagement ridge of the first side panel cricket and the retention structure with the outer edge, and engage the roof or window panel with the inner edge, the cap resiliently snapping in place and providing waterproofing and rigidity to the first side structure.

In particular embodiments, an upper edge of the roof or window panel can be secured and sealed with a header panel. The header panel can have an outer header flange for interfacing with roofing or siding. A raised cricket can extend inwardly from the outer header flange for directing water away from the upper end of the roof or window panel. The cricket can have a slot for accepting and trapping the upper edge of the roof or window panel. An inner header flange can extend inwardly from the cricket below the slot for securement to the roof or side of a structure. A second side of the roof or window panel can be secured and sealed with a second side structure. A lower edge of the roof or window panel can be secured and sealed with a sill panel. The sill panel can have an outer sill flange for interfacing with roofing or siding. An inner sill flange can extend inwardly from the outer sill flange for securement to the roof or side of the structure. A retention slot can extend outwardly from the inner sill flange over at least a portion of the inner sill flange for receiving and trapping the lower edge of the roof or window panel. The header panel, side panels, caps and sill panel can be formed from sheet metal. The retention structure can include at least one anchor member. The at least one anchor member can be secured to the first side of the roof or window panel. A structure along the first side of the roof or window panel can be engaged with the at least one anchor member.

The header panel slot can have an exterior slot member and an interior slot member. The exterior slot member can include a first portion extending in a downhill direction from the raised cricket in a spaced relationship to the interior slot member. A second portion can extend from the first portion towards the interior slot member for trapping the window panel between the second portion of the exterior slot member and the interior slot member. The header panel slot can be formed of sheet metal extending inwardly in the downhill direction from the raised cricket and bent to provide the first and second portions of the exterior slot member with two layers of sheet metal, and the interior slot member with one layer of sheet metal. The sheet metal forming the first portion of the exterior slot member can extend inwardly in the downhill direction from the raised cricket generally parallel to the interior slot member and can be bent from the first portion and extend towards the interior member to form the second portion of the slot member, and can be bent against and extend along the second portion and the first portion of the exterior slot member to form the second and first portions with a double sheet metal layer, and can be bent from the first portion of the exterior slot member towards the interior slot member to form an uphill member of the header panel slot, and can be bent inwardly in the downhill direction from the uphill member to form the interior slot member. At least a portion of at least one slot member can be capable of resilient deflection for gripping the window panel. The first portion of the exterior slot member can extend in a downhill direction from the raised cricket at least about 1 inch and the second portion can extend from the first portion about 1.2 inches.

The open polygonal channel cap can be elongate and can have a cross section with a laterally inwardly extending side panel engagement leg forming the outer edge for engaging the engagement ridge of the first side panel. An outer side wall can extend in an exterior direction from the side panel engagement leg. An exterior connecting wall can extend laterally inwardly from the outer side wall. An inner side wall can extend in the interior direction from the exterior connect-

ing wall and terminate in an outwardly angled window panel engagement leg forming the inner edge that extends in an angled direction towards the outer side wall and the exterior connecting wall. In the cross section of the open polygonal channel cap, the side panel engagement leg can be shorter than the exterior connecting wall, the inner side wall can be shorter than the outer side wall, and the window panel engagement leg can be shorter than the exterior connecting wall. The open polygonal channel cap can be formed of sheet metal, with respective bent corners between the side panel engagement leg and the outer side wall, between the outer side wall and the exterior connecting wall, between the exterior connecting wall and the inner side wall, and between inner side wall and the window panel engagement leg. In the cross section of the open polygonal channel cap, the side panel engagement leg can be about 0.33 inches, the outer side wall can be about 1.3 inches, the exterior connecting wall can be about 0.95 inches, the inner side wall can be about 0.8 inches, and the window panel engagement leg can be about 0.25 inches. The open polygonal channel cap can have a cross section including a perimeter with 5 sides with an opening between the outer edge and the inner edge.

The engagement ridge of the side panel can extend laterally outwardly from the raised side panel cricket and can be generally channel shaped for engaging the open polygonal channel cap. The side panel can be formed of sheet metal and the engagement ridge can have the retention structure engagement leg which can be bent laterally outwardly from the side panel raised cricket. An outer side wall can be bent from the retention structure engagement leg in the exterior direction, and an exterior wall can be bent laterally inwardly from the outer side wall. In the cross-section of the engagement ridge, the retention structure engagement leg can be about 0.43 inches, the outer side wall can be about 1.25 inches and the exterior wall can be about 0.65 inches. The open polygonal channel cap can engage the retention structure engagement leg, the outer side wall and the exterior wall.

The retention slot of the sill panel can include an interior slot member extending outwardly in the downhill direction from the inner sill flange. A slot end wall can extend in the exterior direction from the interior slot member, and an exterior slot member can extend inwardly in the uphill direction. The exterior slot member of the retention slot of the sill panel can have a bent portion for resiliently gripping the window panel. The sill panel can be formed of sheet metal.

A panel joining component can join two window panels together and can have an uphill panel slot and a downhill panel slot. The panel joining component can be formed of a single piece of sheet metal bent into a generally H shaped cross section for forming the uphill and downhill panel slots, with the uphill panel slot having opposing walls with two layers of sheet metal, and the downhill panel slot having opposing walls with a single layer of sheet metal. The downhill slot can have an exterior wall having an bent edge for resiliently gripping a respective window panel.

The present invention can also provide a method of securing a window panel to a side panel with an open polygonal elongate channel cap formed of sheet metal. The channel cap can have a cross section including a laterally inwardly extending side panel engagement leg forming an outer edge for engaging an engagement ridge of the side panel. An outer side wall can extend in an exterior direction from the side panel engagement leg. An exterior connecting wall can extend laterally inwardly from the outer side wall. An inner side wall can extend in the interior direction from the exterior connecting wall and terminate in an outwardly angled window panel engagement leg forming an inner edge and extending in an angled direction towards the outer side wall and the exterior connecting wall, for engaging the window panel. The channel cap can have respective bent corners between the side panel engagement leg and the outer side wall, between the outer side wall and the exterior connecting wall, between the exterior connecting wall and the inner side wall, and between the inner side wall and the window panel engagement leg.

In particular embodiments, there can be an opening between the outer edge and the inner edge. In the cross section, the side panel engagement leg can be shorter than the exterior connecting wall, the inner side wall can be shorter than the outer side wall, and the window panel engagement leg can be shorter than the exterior connecting wall. In the cross-section of the channel cap, the side panel engagement leg can be about 0.33 inches, the outer side wall can be about 1.3 inches, the exterior connecting wall can be about 0.95 inches, the inner side wall can be about 0.8 inches and the window panel engagement leg can be about 0.25 inches.

The present invention can provide a roof or window panel to metal roofing interface securement system that facilitates the integration of a roof or window panel system into new or pre-existing construction. The system can be comprised of components which can be specifically designed and fabricated to integrate the roof or window panel system into most or all currently available metal roofing or siding systems. The system can have watertight integrity with specific consideration for the existing environment in which the system is installed. The system can have a minimum number of components, to insure simple and reliable field installation by metal roofing or siding contractors utilizing standard tools and practices. The system can be compatible with or manufactured from existing roofing or siding materials to comply with roof system manufacturers warranties. The system can be aesthetically compatible with most or all associated building components.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing will be apparent from the following more particular description of example embodiments of the invention, as illustrated in the accompanying drawings in which like reference characters refer to the same parts throughout the different views. The drawings are not necessarily to scale, emphasis instead being placed upon illustrating embodiments of the present invention.

FIG. **1** is a schematic perspective view of a representation of a roof or window panel.

FIG. **2** is a schematic perspective view of a portion of a metal roof or siding with a roof or window panel interface securement system.

FIG. **3** is a perspective view of a roof window panel system mounted to a metal roof with an embodiment of the present invention interface securement system.

FIG. **4** is a perspective view of a portion of an embodiment of an interface header in the present invention securing a panel to a roof.

FIG. **5** is an end view of the embodiment of FIG. **4**.

FIG. **6** is a cross-sectional view of a portion of one embodiment of a side structure having a side panel and cap in the present invention securing and sealing the side of one particular type of panel to a roof.

FIG. **7** is a perspective view of a portion of an embodiment of a side structure in the present invention.

FIGS. **8-11** are end views of embodiments of the side structure.

FIG. **12** is an end view of an embodiment of a channel cap.

FIGS. **13** and **14** are perspective views of a portion of an embodiment of a sill panel engaged with a panel.

FIG. **15** is an end view of an embodiment of a sill panel.

FIG. **16** is a broken away view of a portion of a sill panel at the joint between two roof or window panels.

FIG. **17** is a side sectional view of another embodiment of the present invention interface securement system securing and sealing window panels.

FIG. **18** is a cross sectional view of the embodiment of FIG. **18**.

FIG. **19** is an enlarged sectional view of an embodiment of a header panel gripping a window panel.

FIG. **20**. is an enlarged sectional view of an embodiment of a side structure secured to a window panel.

FIG. **21** is an enlarged sectional view of an embodiment of a sill panel gripping a window panel.

FIG. **22** is an enlarged sectional view of a panel joining component joining two window panels together.

FIG. **23** is a perspective view of a portion of window panels joined together with a panel joining component.

DETAILED DESCRIPTION

A description of example embodiments of the invention follows.

The perimeter of commercially available roof or window panels often provides no obvious means of integration with or to any existing metal roof system. One example of such a roof or window panel can be an extruded plastic honey comb polycarbonate panel, such as a Lexapanel™ panel made by Sabic Innovative Plastics.

With regard to the securement of the sides of the roof or window panel, in the present invention system, an extremely complex shape can be used to actively engage the profiles of the roof or window panel on the sides for securement to a roof or siding. Also, a simplified profile utilizing a snap or "friction engaged" batten or open polygonal channel cap can provide securement and allow thermal movement, provide a water tight seal and serve as a double structural element along the sides of the panels.

Referring to FIG. **1**, some roof or window panels **10** can be extruded from plastic and can be at an average of 20 mm thickness and can be longitudinally honeycombed **12** so the top **14** and bottom **16** ends are not sealed, and therefore must be provided with some means of protection from water, ice and snow.

With regard to the top or upper end of the roof of window panel, in the present invention system, a header profile can be used to both protect and anchor the top, upper, upstream, uphill end or edge **14** of the roof or window panel **10** while also providing a means to attach various roofing or siding profiles as needed. The header can have a flat "s" or reverse bend **32** for roof interface, a cricket or raised portion for directing water of minimum height, and encapsulate the panel top **14** for weather protection. Thermal expansion and live movement from wind can be addressed or provided in this header profile.

Since the bottom **16** of the roof or window panels **10** can be open to the elements, a sill panel can be used for securement and sealing in the present invention. The water and ice from the area above the sill panel poses a significant difficulty. Closing the bottom end **16** without creating a potential dam situation is provided in the present invention with a robust design.

In the present invention, a sill flange of the sill panel can have a retention slot that can receive, trap and seal the bottom, downstream, downhill or lower end or edge **16** of the roof or window panel **10**, and as load increases a gasket can be forced tighter creating "live active seal."

Referring to FIG. **2**, with regard to egress and tolerances, the vast majority of metal roof or siding systems require for a roof **18** some distance between ribs, seams or joints **18***a* of the siding or roof panels, members, or elements **18***b* in order to properly drain water and to manipulate materials around any roof/wall penetrations or window assemblies **28**.

X represents a minimum distance to provide adequate drainage for the area above the penetration. If the minimum distance X is not met, the penetration (skylight, etc.) typically forms a dam or pond on the roof. The present invention roof or window panel interface securement system **20** can provide enough materials around the sides **22**, header or head **24** and sill **26** to create a roof panel interface, such as at a rib **18***a*, that is a distance X of at least 10 inches from the roof or window panel interface securement system **20** to prevent damming. The header can provide 6 to 8 inches clearance or extension in order to properly fasten to the roof.

Some embodiments of extruded plastic roof or window panels **10** can be made with a finished thickness of 20 mm but several thicknesses are possible. In one embodiment, the roof or window panels can be Lexapanel™ panels, but other types of roof or window panels can be used with the present invention, including flat and/or solid panels. Modifications to the interface profiles are easily accommodated and thicker or thinner roof or window panels will have no effect on system integrity. The present invention can have modified shapes and dimensions to accommodate different types of roof or window panels.

Various siding and roofing profiles currently exist and more are developed regularly. Virtually any seam or panel edge treatment can be incorporated into the "roof siding" section of the interface. The present invention can also be used with siding and roofing that is not metal. The installer can create custom "locks" or seams to integrate the present invention roof or window panel interface securement system **20** with various roofs and siding.

A vertical or upright "leg" can be incorporated at any location desired in the interface panel to join with roofing or siding, such as at a rib **18***a*.

Referring to FIG. **3**, one embodiment of the present invention interface securement system **20** for a roof or window panel **10** is shown securing two panels **10** of a window panel or glazing system to a metal roof **18**, forming a window assembly **28**. The roof or window panel **10** can be referred to as window panel **10** for both roof and siding applications. Window panels **10** can be secured to each other by a batten or locking cap **9** which engages ridges **11** on the sides **15** of the window panels **10**, and by retention structures **68** having arms **68***a* inserted into slots **13** (FIG. **6**). The retention structures **68** can be secured to structural elements **19** of the roof **18** by screws **34***a*. The securement system **20** can include a top, upper, upstream, uphill or header panel **24**, two side structures **22** and a sill panel **26**, for securing and sealing the panel **10** or glazing system to the roof **18**. Referring to FIGS. **2**, **4** and **5**, the header panel **24** can be laterally elongate and can have a laterally elongate top, upper, upstream, uphill or outer header periphery flange **30**, which can be interfaced with or inserted under the roofing **18**, for securement with fasteners **34***a* through a series of holes **34** and can have a flat S or reverse bend **32**. A laterally elongate raised portion or cricket **36** extending at the bottom or downhill side of the outer header flange **30** can direct water away from the upper end of the window panels **10**. The cricket **36** can have a laterally elongate gripping, retention or trapping header panel slot **38** for accepting and trapping the upper edge **14** of the window

panels **10** in a waterproof or sealed manner. A laterally elongate inner, bottom, downstream, downhill or lower header periphery flange **40** can extend downhill or inwardly from the cricket **36** or slot **38** and below the slot **38**, for securement to the roof **18** with fasteners **34** such as screws or nails. The header panel **24** can be formed of sheet metal and can have a generally flat outer header flange **30**. The cricket **36** can be bent upwardly, outwardly in the downhill or downstream exterior environment direction from the outer header flange **30**, then bent back under the cricket **36** and below the cricket **36** to form the slot **38**. The inner header flange **40** can be bent below the slot **38**.

The header panel **24** can be formed of 24 gauge (0.024 inches thick) steel sheet metal which can provide strength and rigidity. The outer **30** and inner **40** header flanges can have a series of spaced apart holes **34** for securement to the roof **18**. The outer header flange **30** can be generally flat, with a laterally elongate flat S or reverse bend **32** positioned below holes **34** near the uphill end of the outer header flange **30**. The raised cricket **36** can have a laterally elongate rising portion **37** bent, curved or angled from the outer header flange **30**, along a laterally elongate or extending fold line or bend **42**, and extend in the inward or downhill direction, extending in a rising manner in the exterior environment direction away from the plane of the outer header flange **30**, the window panel **10**, and roof **18** or siding, which can be, for example, at a 45° angle. The header panel slot **38** can be formed between an exterior slot wall, structure, surface or member **39**, and an interior slot, wall, structure, surface or member **45**. The exterior slot member **39** can include a first laterally elongate portion **39***a* extending in an inwardly downhill or downstream direction from the raised cricket **36** and can be generally parallel to the outer **30** and inner **40** flanges, and the interior slot member **45**. The first portion **39***a* can be bent from the rising portion **37** along a laterally elongate or extending fold line or bend **44**. The exterior slot member **39** can have a laterally elongate or extending second portion **39***b* that is bent from the first portion **39***a* along a laterally elongate or extending fold line or bend **46** and extend towards the interior slot member **45** generally perpendicular to the outer flange **30**, the window panel **10** and the interior slot member **45**. The sheet metal forming the exterior slot member **39** can be bent along a laterally elongate or extending fold line or bend **48** to form a laterally elongate or extending contacting or sealing surface or edge that contacts and seals against the window panel **10**. An additional laterally elongate or extending fold line or bend **50** can be made in the sheet metal to form second or double interior sheet metal layers **39***c* and **39***d* that extend along or against the second **39***b* and first **39***a* portions of the exterior slot member **39**. The sheet metal can be bent along a laterally elongate or extending fold line or bend **52** to form a laterally elongate or extending uphill wall or member **43** of the header panel slot **38** extending from the first portion **39***a* of the exterior slot member **39** and then bent inwardly in the downhill direction from member **43** along a laterally elongate or extending fold line or bend **54** to form the interior slot member **45**. The interior slot member **45** can be laterally elongate or extending and can be on a plane generally parallel to the planes of the outer **30** and inner **40** header flanges. The sheet metal can be bent from the interior slot member **45** along laterally elongate or extending fold lines or bends **56** and **58** to form a laterally elongate or extending transition portion **47** between the interior slot member **45** and the inner header flange **40**.

The double sheet metal layer thickness of the exterior slot member **39** provides it with increased strength and rigidity. The slot gap g can be sized to be slightly smaller than the thickness of the window panel **10** inserted therein so that at least a portion of one of the first **39***a* and second **39***b* portions of the exterior slot member **39** and the interior slot member **45** can resiliently deflect for gripping the window panel **10**. The first portion **39***a* can deflect in the exterior environment direction and the second portion **39***b* can deflect in the inward or downhill direction. The interior slot member **45** can deflect away from the exterior slot member **39**. The resilient gripping of the window panel **10** by the header slot **38** and along the sealing surface **48** can create a seal on the window panel **10** that can move to compensate for thermal expansion or movement due to wind. In one embodiment, the first portion **39***a* of the exterior slot member **39** can extend in the downhill direction from the bend **44** of the raised cricket **36** at least about 1 inch, and the second portion **39***b* can extend from the first portion **39***a* by about 1.2 inches. This can provide the exterior slot member **39** with desired deflection properties for resiliently gripping the window panel **10**. The exterior **39** and interior **45** slot members can be made to initially angle towards each other or be closer together, and can be expanded away from each other when the window panel **10** is inserted into the slot **38**.

Referring to FIGS. **6-12**, one embodiment of the side structures **22** is shown. Each side structure **22** can secure and seal the sides **15** of the window panels **10** and can include a side panel **60** having an outer side lateral periphery flange **62** for integrating or interfacing with roof panels **18***b*, which can include lateral insertion under the roofing **18***b* or securement to ribs **18***a*. The side panel **60** can be elongate in the uphill/downhill direction, and the uphill end of the side structure **22** or the outer side flange **62** can be inserted under the header panel **24**. A raised portion or cricket **64** can extend laterally inwardly from the outer side flange **62** for directing water away from the outer sides **15** of the window panels **10**. An elongate engagement ridge, edge, protrusion or structure **66** can extend along an inner edge of the cricket **64** for engaging a retention structure **68** extending or positioned along the sides of the window panels **10**. In one embodiment, the retention structures **68** can be one or more anchor brackets, members or clips which can have an arm or protrusion **68***a* engaged or positioned within structures such as elongate slots **13** within the sides **15** of the panels **10**, and are secured to structural elements **19** of the roof **18** with fasteners **34***a*, for securing the panels **10** to the roof **18**. In other embodiments, various other retention structures can be mounted around or over the sides of the window panels **10**. The engagement ridge **66** can engage underneath another surface, edge, structure, protrusion or arm **68***a* of the retention structures **68**, for securement of the side panel **60** to the retention structure **68** and to the roof **18**. This traps the side panel **60** between the retention structure **68** and the roof **18**. The side panel **60** can be formed of sheet metal and can have a generally flat outer side flange **62**. The cricket **64** can be bent upwardly from the outer side flange **62** and bent back onto itself laterally outwardly to form the engagement ridge **66**. The sheet metal can be bent vertically up from the engagement ridge **66** and then bent laterally inwardly to form a channel structure **70** with an upper ridge or leg **70***c* for an open polygonal channel batten cap **72** to engage around.

The open polygonal channel batten cap **72** can have an outer edge **73** formed by a side panel engagement wall or leg **72***a* (FIGS. **6** and **10-12**) which can engage an underside surface of the engagement ridge **66** of the side panel **60** and can trap and secure the engagement ridge **66** against the underside of the arm **68***a* of the retention structure **68** to lock in place in a sandwiched manner. An inner edge **75** of the cap **72** formed by a window panel engagement wall or leg **72***e* can

engage an upper surface of the window panel **10** and can be resiliently snapped in place around the upper ridge **11** of the window panel **10**. The cap **72** with its polygonal channel shape with the opening facing down, can provide water proofing, elongate rigidity and securement to the connection between the window panels **10** and the side panels **60** of the side structure **22**. The snap fit of the cap **72** can allow quick and easy installation while at the same time rigidly securing the window panels **10** to the side panel **60** to the retention structure **68** and to the roof **18**. Some window panels **10** can have an upwardly extending elongate ridge **11** with elongate ridge members or notches **11***a* for securement to the inner edge **75** of the cap **72**. The channel cap **72** can be formed of sheet metal and can have a generally interior or downwardly facing asymetrical channel, with a lateral top or exterior connecting cover wall **72***c*, a vertical outer leg or outer side wall **72***b*, and a vertical inner leg or inner side wall **72***d* bent and extending downwardly towards the interior from opposite sides of the top or exterior connecting wall **72***c*. The outer edge **73** can be bent laterally inwardly into the channel from the outer leg **72***b*, and the inner edge **75** can be bent at an angle upwardly inwardly into the channel from the inner leg or side wall **72***d*. In some embodiments, flat window panels **10** can be used, and the engagement ridge **66**, channel cap **72** and retention structure **68** can be configured appropriately.

The side panel **60** of each side structure **22** can be formed of 24 gauge steel sheet metal and can have an uphill/downhill extending upright rib member **63** bent along a fold line or bend **63***a* from the outer side flange **62** to be at the outer side periphery. The rib member **63** can be positioned from the channel cap **72** by about or more than the distance X (FIG. **8**) for securement to ribs **18***a* of the roof panels **18***b*, such as by bending ends of the ribs **18***a* and **63** together to form a sealed joint or seam. The raised cricket **64** can be formed by bending the sheet metal along one or more elongate fold lines or bends **76**, **78** and **80** to rise into the exterior environment direction. The raised cricket **64** can have an angled step as shown in FIG. **6**, which can provide rigidity and can engage a portion of the retention structure **68** for further strength. The engagement ridge **66** can be formed by bending the sheet metal along an elongate fold line or bend **82** at the inner edge of the cricket **64**, and extending laterally outwardly. The bend **82** can be at an angle to form a structural corner for the engagement ridge **66**, for providing strength and rigidity, for example, about 30 degrees relative to the cricket **64**, where a portion of the cricket having bend **82** can be trapped between arm **68***a* and legs **68***b* of the retention structure **68** for interlocking. The engagement ridge **66** can be bent into a channel shaped structure **70** for engaging the channel cap **72** and can have a retention structure engagement wall or leg **70***a* bent laterally outwardly from the cricket **64**, an outer side wall or leg **70***b* bent along elongate fold line or bend **84** from leg **70***a* in the exterior direction, and an exterior wall or leg **70***c* bent laterally inwardly from wall **70***b* along elongate fold line or bend **86** (FIG. **11**). The walls **70***a*, **70***b* and **70***c* can be engaged by respective walls **72***a*, **72***b* and **72***c* of the channel cap **72** to form a double layer sheet metal structural element or portion which is channel shaped and provides increased strength and rigidity to the side structures **22** extending along the sides **15** of the window panels **10**, for keeping the window panels **10** rigidly secured in place to resist forces from wind, rain, ice and snow. In some embodiments, the engagement ridge **66** can have a cross section where the retention structure engagement leg **70***a* is about 0.43 inches long, the outer side wall **70***b* is about 1.25 inches long, and the exterior wall **70***c* is about 0.65 inches long. By having the outer side wall **70***b* a longer or taller wall than walls **70***a* and **70***c*, and extending in the exterior environment direction, the channel shaped structure **70** can form a structural beam that has strength and rigidity in the interior/exterior directions.

The open polygonal channel cap **72** can be formed of 24 gauge steel sheet metal and can have an elongate length, for example 10 feet with elongate walls **72***a*-**72***e*. The channel cap **72** can have a cross section with a laterally inwardly extending side panel engagement wall or leg **72***a* forming the ridge, protrusion or outer edge **73**, with an outer side wall or leg **72***b* extending in an exterior direction from the side panel engagement leg **72***a*. An exterior connecting wall or leg **72***c* can extend laterally inwardly from the outer side wall **72***b*. An inner side wall or leg **72***d* can extend in the interior direction from the exterior connecting wall **72***c* and terminate in an outwardly angled window panel engagement wall or leg **72***e*, which forms the inner ridge, protrusion or edge **75**. The window panel engagement leg **72***e* can extend in an angled direction into the interior of the channel cap **72** towards the outer side wall **72***b* and the exterior connecting wall **72***c*, for example, about 60° relative to inner side wall **72***d*. The channel cap **72** can have elongate fold lines, bends or bent corners, **74***a* between the side panel engagement leg **72***a* and the outer side wall **72***b*, **74***b* between the outer side wall **72***b* and the exterior connecting wall **72***c*, **74***c* between the exterior connecting wall **72***c* and the inner side wall **72***d*, and **74***d* between the inner side wall **72***d* and the window panel engagement leg **72***e*. An elongate opening can extend between outer edge **73** and inner edge **75** at a location diagonally from corner **74***b*. In the cross section of the channel cap **72**, the side panel engagement leg **72***a* can be shorter than the exterior connecting wall **72***c*, the inner side wall **72***d* can be shorter than the outer side wall **72***b*, and the window panel engagement leg **72***e* can be shorter than the exterior connecting wall **72***c*. In one embodiment, in the cross section of channel cap **72**, the side panel engagement leg **72***a* can be about 0.33 inches long, the outer side wall **72***b* can be about 1.3 inches long, the exterior connecting wall **72***c* can be about 0.95 inches long, the inner side wall **72***d* can be about 0.8 inches long, and the window panel engagement leg **72***e* can be about 0.25 inches long. When looking at the channel cap **72** along its length, these dimensions can be considered widths of the walls. The cross section of the channel cap **72** can be described as being asymmetrical with different length side walls **72***b* and **72***d* extending from opposite sides of the connecting wall **72***c*, which have respective ridges, protrusions or edges **73** and **75** extending into the interior of the channel.

Referring to FIGS. **6**, **7** and **12**, when installing the channel cap **72** in place, the channel cap **72** can be set over the engagement ridge **66** of the side panel **10** and the ridge **11** of the window panel **10**. One end of the channel cap **72** can be pressed by hand or by rubber mallet, pressing or applying pressure P (FIG. **7**). As pressure P is applied, the outer edge **73** and the side panel engagement leg **72***a* of the channel cap **72** is pushed down or against along the wall **70***b* of the engagement ridge **66**, and the inner edge **75** and the angled window panel engagement leg **72***e* is pushed down across the top and along the side of the ridge **11** of the window panel **10**. This deflects the walls **72***b* and **72***d* outwardly away from each other. The angle of the window panel engagement leg **72***e* facilitates the downward movement and allows passage over the tip of ridge **11**. Movement continues until the side panel engagement leg **72***a* of channel cap **72** snaps around and engages the leg **70***a* of the engagement ridge **66**, and the window panel engagement leg **72***e* engages a notch **11***a* of ridge **11**, snapping in place. As the end of channel cap **72** is snapped in place, the pressure P can be progressively applied along the length of the channel cap **72** to progressively snap

the elongate lengths of the legs **72***a* and **72***e* with the leg **70***a* of engagement ridge **66** and notch **11***a*, until completely snapped in place. This can provide a secure attachment without the use of fasteners or adhesives. The dimensions of the mating engagement ridge **66** and the channel cap **72** are selected so that when the channel cap **72** is snapped into place, some or all of the legs or walls **72***a*-**72***e* are still deflected relative to each other or outwardly relative to each other, which can exert inward compressive forces F from the lateral and interior/exterior directions, as shown in FIG. **12**. The channel cap **72** not only squeezes the window panel **10**, the engagement ridge **66** of the side panel **60**, and the retention structures **68** together with it, but in combination with the channel shaped structure **70**, collectively forms a composite structural element along the side of the window panel **10** for providing increased rigidity. The channel shaped structure **70** when combined with the channel cap **72**, can be described as having or being a 3-sided channel shape, or being a channel from 3 different sides. By using 24 gauge steel, once snapped in place, the channel cap **72** typically cannot be removed, except by destroying or damaging it.

Referring to FIGS. **13**-**16**, the sill panel **26** in one embodiment, can be laterally elongate and have an outer, lower, downstream or downhill outer sill flange **90** for positioning under the side structures **22** and interfacing with or positioning over roofing **18***b*. An inner sill flange **92** can extend inwardly, upstream, upwardly or uphill from the outer sill flange **90** for securement to the roof **18** with fasteners **34***a*. An uphill facing elongate retention slot **94** can extend above and outwardly in the exterior direction or downhill from the inner sill flange **92** over at least a portion of the inner sill flange **92** for receiving, trapping, gripping and sealing a lower edge **16** of the window panel **10**. The retention slot **94** can be sealed with a gasket or sealant for water proofing purposes. The sill panel **26** can be formed of 24 gauge steel sheet metal and can have a generally flat outer sill flange **90**. The inner sill flange **92** can be at the uphill end of, or from, the outer flange. The retention slot **94** can be formed by bending the sheet metal back over itself or over and downhill above in the exterior direction at least a portion of the inner flange **92** to form an interior slot member **94***a*, then bent vertically upwardly or in the exterior direction to form a slot end wall **94***b* and laterally uphill to form an exterior slot member **94***c*. The exterior slot member **94***c* can have a seal with the window panel **10** and can compensate for movement.

FIGS. **17**-**23** depict another embodiment of an interface securement system **20** and a window assembly **28** which can include a panel joining component **100** for joining the bottom **16** and top **14** ends of two window panels **10** together. The panel joining component **100** can have an uphill panel slot **102** for accepting the bottom end **16** of an uphill window panel **10**, and a downhill panel slot **104** for accepting the top end **14** of a downhill window panel **10**. The panel joining component **100** can be formed from a single piece of 24 gauge steel sheet metal bent into a generally H shaped cross-section with the uphill panel slot **102** having opposing interior **102***a* and exterior **102***b* walls with two layers of sheet metal, and the downhill panel slot **104** having opposing interior **104***a* and exterior **104***b* walls with a single layer of sheet metal (FIG. **22**). The uphill panel slot **102** can also have an end wall **106**. The interior walls **102***a* and **104***a* can be longer or wider than the opposing exterior walls **102***b* and **104***b* to facilitate insertion of the window panels **10**. The uphill window panel **10** can be sealed within the uphill slot **102** with a sealant.

The exterior wall **104***b* of the downhill slot **104** can have a bent, angled, or curved end or edge **108** for contacting the top end **14** of the downhill window panel **10** along a resilient contact or seal line, which can allow movement of the window panel **10** within the downhill slot **104** while remaining sealed. The interior wall **104***a* can have an extended portion **110** that can be bent to allow the window panel **10** to rest upon it before insertion. A resilient or compressible member, seal or gasket **112** can be positioned within the downhill slot **104** to provide sealing, as well as absorb vibration from wind, absorb shock and keep dust from accumulating.

Referring to FIG. **19**, the header panel **24** in use, can have deflection in at least one of the first **39***a* and second **39***b* portions of the exterior slot member **39**, as shown, for resiliently gripping the window panel **10**. For example, the second portion **39***b* can deflect in the downhill direction.

Referring to FIG. **20**, the engagement ridge **66** of the side panel **60** can be positioned such that the arm **68***a* of the retention structure **68** extends into the corner of the channel shaped structure **70** between leg **70***a* and wall **70***b*, which can provide further strength and rigidity.

Referring to FIG. **21**, the exterior slot member **94***c* of the retention slot **94** can have a bent, curved or angled uphill edge **114** for resiliently engaging and sealing against the exterior surface of the window panel **10** in a manner that allows sealed thermal expansion movement.

Although FIGS. **1**-**23** have been shown for securing roof window panels **10** to a roof **18**, it is understood that the window panels **10** in other embodiments can be secured to the walls of a structure and can be interfaced with the siding of the structure in a similar manner. The header panel **24**, side panels **60**, channel cap **72** and sill panel **26** can be formed or bent from sheet metal, such as steel. In other embodiments, some or all of these components can be formed by other suitable methods, including molding or fabrication, or formed of other suitable metals or of nonmetallic materials.

The present invention can provide a simple to install water tight method for the use of roof or window panels, and can isolate the metal roof/siding system from the roof or window system to control thermal expansion differences between the two dissimilar materials, and the header panel **24**, side structures **22**, and sill panel **26** can allow thermal expansion movement with live or moving sealing relative to the window panels **10**. The same materials used in the roof/siding system can be used in order to maintain factory roofing warranties. Field formed flashing systems and sealants which may harm panels can be eliminated, and the need to mechanically fasten or penetrate the panel system can be eliminated. The present invention can be designed and tested to meet building codes, wind uplift, and engineering standards, and can be installed with standard tools and basic roofing/siding practices. The present invention can create a low profile (non curb mounted) roof glazing system, and can be installed on low slope, steep slop roofs or vertically into wall systems. A modular construction can allow for systems much larger than standard windows or skylights. The present invention can be manufactured using C.N.C. forming equipment insuring product consistency.

While this invention has been particularly shown and described with references to example embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the scope of the invention encompassed by the appended claims.

For example, various dimensions can vary depending upon the situation at hand. The various terms of direction given, can change or vary depending upon the orientation of the components.

What is claimed is:

1. A securement system for a roof or window panel comprising:

a first side structure for securing and sealing a first side of the roof or window panel comprising a first side panel having an outer side flange for interfacing with roofing or siding, a raised cricket extending inwardly from the outer side flange for directing water away from the first side of the roof or window panel, an elongate engagement ridge extending laterally outwardly from an inner edge of the cricket for engaging an underside of a retention structure extending along the first side of the roof or window panel mounted to a roof member, and then extending in an exterior direction, and an elongate open polygonal channel cap having an outer edge for engaging at least one of an underside of the elongate engagement ridge of the first side panel cricket and the underside of the retention structure, and an inner edge for engaging an elongate upright ridge extending from the roof or window panel in the exterior direction, the cap having an exterior connecting wall and resiliently deflectable outer and inner side walls extending from opposite sides of the exterior connecting wall in an interior direction, the outer and inner edges of the cap extending from respective outer and inner side walls with an elongate opening therebetween, the outer and inner side walls of the cap configured to be resiliently deflectable away from each other during installation over the elongate engagement ridge of the first side panel cricket and the upwardly extending elongate ridge of the roof or window panel, respectively, and resiliently snapped in place around and for securing the elongate engagement ridge of the cricket and the elongate upright ridge extending from the roof or window panel together, and providing waterproofing and rigidity to the first side structure.

2. The securement system of claim 1, in which the retention structure comprises at least one anchor member secured to the first side of the roof or window panel.

3. The securement system of claim 2, in which the at least one anchor member engages a structure along the first side of the roof or window panel.

4. The securement system of claim 1 in which the open polygonal channel cap is elongate and has a cross section with a laterally inwardly extending side panel engagement leg forming the outer edge for engaging the engagement ridge of the first side panel, the outer side wall extending in an exterior direction from the side panel engagement leg, the exterior connecting wall extending laterally inwardly from the outer side wall, the inner side wall extending in the interior direction from the exterior connecting wall and terminating in an outwardly angled window panel engagement leg forming the inner edge that extends in an angled direction toward the outer side wall and the exterior connecting wall.

5. The securement system of claim 4 in which in the cross section of the open polygonal channel cap, the side panel engagement leg is shorter than the exterior connecting wall, the inner side wall is shorter than the outer side wall, and the window panel engagement leg is shorter than the exterior connecting wall.

6. The securement system of claim 5 in which the open polygonal channel cap is formed of sheet metal, with respective bent corners between the side panel engagement leg and the outer side wall, between the outer side wall and the exterior connecting wall, between the exterior connecting wall and the inner side wall, and between the inner side wall and the window panel engagement leg.

7. The securement system of claim 6 in which in the cross section of the open polygonal channel cap, the side panel engagement leg is about .33 inches, the outer side wall is about 1.3 inches, the exterior connecting wall is about .95 inches, the inner side wall is about .8 inches, and the window panel engagement leg is about .25 inches.

8. The securement system of claim 1 in which the open polygonal channel cap has a cross section comprising a perimeter with 5 sides with an opening between the outer edge and the inner edge.

9. The securement system of claim 1 in which the engagement ridge of the side panel extends laterally outwardly from the raised side panel cricket and is generally channel shaped for engaging the open polygonal channel cap.

10. The securement system of claim 9 in which the side panel is formed of sheet metal and the engagement ridge has a retention structure engagement leg bent laterally outwardly from the side panel raised cricket, the outer side wall bent from the retention structure engagement leg in the exterior direction, and an exterior wall bent laterally inwardly from the outer side wall.

11. The securement system of claim 10 in which in a cross section of the engagement ridge, the retention structure engagement leg is about .43 inches, the outer side wall is about 1.25 inches and the exterior wall is about .65 inches.

12. The securement system of claim 10 in which the open polygonal channel cap engages the retention structure engagement leg, the outer side wall and the exterior wall.

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